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CLOSE AIR SUPPORT

HEARING

BEFORE THE

PROCUREMENT AND MILITARY NUCLEAR SYSTEMS SUBCOMMITTEE

AND THE

INVESTIGATIONS SUBCOMMITTEE

OF THE

COMMITTEE ON ARMED SERVICES
HOUSE OF REPRESENTATIVES

ONE HUNDRED FIRST CONGRESS

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CLOSE AIR SUPPORT

House of Representatives, Committee on Armed Services, Procurement and Military Nuclear Systems Subcommittee, and the Investigations Subcommittee,

Washington, DC, Wednesday, April 19, 1989.

The subcommittees met, pursuant to call, at 1 p.m., in room 2118, Rayburn House Office Building, Hon. Les Aspin, (chairman of the Subcommittee on Procurement and Military Nuclear Systems) presiding.

STATEMENT OF HON. LES ASPIN, A REPRESENTATIVE FROM WISCONSIN, CHAIRMAN, PROCUREMENT AND MILITARY NUCLEAR SYSTEMS SUBCOMMITTEE

The Chairman. The meeting will come to order.

Today, the Procurement and Investigations Subcommittees initiate a joint review of the close air support issue. The inquiry is prompted by a perception that a rush-to-judgment mood has dominated the Department of Defense's thinking about a replacement for the existing fixed-wing close air support aircraft, the A–10.

In our view, before any multi-billion dollar hardware decision on fixed-wing aircraft is made, some very basic and fundamental questions need to be addressed.

First, are we really talking about close air support or should we be talking in more systemic terms about close support for our ground forces?

While both concepts involve operations close to the battle line, it would appear that close air support is the more narrowly focused of the two. Perhaps it is more appropriate to consider other aspects of how we best support our ground forces.

This approach raises a second fundamental point, the question of roles and missions. Currently, close air support is considered an Air Force mission. As such, a different perspective on the relative priorities on how to address the requirements may exist.

To strengthen the analysis, it would seem logical to look at the question of close support requirements as an Army mission, including the fixed-wing aircraft component.

Today, we really have three approaches to close air support. The Air Force version that emphasizes the A–10; the Army plan that uses both attack helicopters as dedicated air support, and Air Force aircraft as designated support; and the Marine Corps plan that has the AV–8B Harrier as organic dedicated support.

It is appropriate in this instance to examine the feasibility of rationalizing our priorities. In a flat budget era, we need to think about ways to make tradeoffs among competing programs.

Central to this point is the need to consider the utility of fixed-wing aircraft as part of a larger equation. Clearly, the impact of such factors as the changing nature of the battlefield that emphasizes greater maneuverability of ground forces and increased lethality, the introduction on new technology, the role of the attack helicopters, the increased demand for integrated C3, and the impact of ground systems such as artillery, the M-1 tank, the Stinger-type missile and the MLRS rocket system, needs to be taken into account.

These issues suggest that any decision about a fixed-wing aircraft is not a simple matter. We need to resist any temptation to make a quick call on the issue. We need to understand fully the relative costs, contributions and benefits that such aircraft bring to the equation.

Equally, if not more important, is the question of whether fixed-wing aircraft can effectively perform the mission in today's environment.

To assist the subcommittees, we are pleased to have with us today, as witnesses, Dr. Hans Mark, the distinguished former Secretary of the Air Force; Maj. Gen. Perry Smith; and Mr. John Krings, the Director of Operational Test and Evaluation.

Mr. Krings will discuss the required close air support operational test plan mandated in Public Law 100-526.

As my colleagues will recall, this requirement was included in the base closure law because of our concern that a decision was going to be made very shortly on the A-10 replacement.

We believe that further analysis is required before any decision is made.

Before we proceed, let me recognize, first of all, the chairman of the Investigations Subcommittee, Nick Mavroules, for a comment.

STATEMENT OF HON. NICHOLAS MAVROULES, A REPRESENTATIVE FROM MASSACHUSETTS, CHAIRMAN, INVESTIGATIONS SUBCOMMITTEE

Mr. MAVROULES. Thank you very much, Mr. Chairman.

Let me also, along with you and the members, welcome all the witnesses this afternoon. We appreciate your cooperation.

I am going to forego my opening statement, Mr. Chairman, and ask that it be placed into the record, but I want to make one final point.

This is the beginning of an inquiry and our witnesses are helping us. We are not trying to give you direction; we are trying to learn from you, and perhaps together we can set some long-range plans.

With that, let me welcome each and every one of you.

Thank you.

PREPARED STATEMENT OF HON. NICHOLAS MAVROULES

CONCERN ABOUT THE CLOSE AIR SUPPORT MISSION HAS BEEN GROWING FOR SEVERAL YEARS. THE DEBATE HAS BEEN CENTERED ON WHAT AIRCRAFT SHOULD REPLACE THE A-10 CLOSE AIR SUPPORT AIRCRAFT WHICH THE AIR FORCE SAYS CANNOT SURVIVE ON PRESENT AND FUTURE BATTLEFIELDS. THE CONGRESS HAS ASKED THE DOD TO PREPARE TEST PLANS TO EVALUATE THE CAPABILITIES OF COMPETING AIRCRAFT BEING CONSIDERED TO REPLACE THE A-10 AND HAS ALSO ASKED DOD TO CONSIDER THE FEASIBILITY OF TRANSFERRING THE CLOSE AIR SUPPORT MISSION TO THE ARMY. WE BELIEVE NOW THAT THE ISSUE IS BROADER THAN PREVIOUSLY FORMULATED.

THE LETHALITY OF THE MODERN BATTLEFIELD RAISES THE QUESTION OF WHETHER FIXED-WING AIRCRAFT CAN SURVIVE AND BE EFFECTIVE IN CARRYING OUT THE CAS MISSION IN THE FUTURE. THE SOVIET EXPERIENCE IN AFGHANISTAN SUGGESTS THAT MODERN AIR DEFENSE WEAPONS, SUCH AS THE STINGER MISSILE, CAN HAVE A MAJOR IMPACT ON DENYING LOW-LEVEL AIR OPERATIONS AGAINST GROUND TARGETS, EVEN IN A RELATIVELY LOW-INTENSITY CONFLICT. WHAT THEN, WOULD A BATTLEFIELD ENVIRONMENT WITH ALL THE AIR DEFENSES AVAILABLE TO A MODERN ARMY BE LIKE FOR CLOSE AIR SUPPORT OPERATIONS?

THE REAL QUESTION IS HOW BEST TO MEET THE SUPPORT REQUIREMENTS OF THE CLOSE-IN BATTLE. THE ARMY IS FIELDING A VARIETY OF FIRE-SUPPORT SYSTEMS, BOTH GROUND SYSTEMS SUCH AS ARTILLERY AND MLRS, AND AERIAL SYSTEMS SUCH AS THE APACHE HELICOPTER. THE AIR FORCE WANTS A NEW FIXED-WING AIRCRAFT -- THE A-16. HOW DOES THIS ALL FIT TOGETHER ON THE BATTLEFIELD OF THE FUTURE? WHAT IS THE MARGINAL EFFECTIVENESS -- OR THE BEST USE -- OF EACH OF THESE WEAPONS SYSTEMS?

WILL IT ALL WORK IN THE "FOG OF WAR". WE INTEND TO SORT OUT THE FUNCTION OF CLOSE SUPPORT AND THEN DETERMINE THE ROLES AND MISSION ISSUE, RATHER THAN TRY TO FIT THE FUNCTION INTO A PREDETERMINED BUREAUCRATIC FORM.

WE WELCOME OUR WITNESSES TODAY. THE DEPTH OF YOUR BACKGROUNDS AND INTELLECTS WILL HELP US FRAME THE RIGHT QUESTIONS. WE'RE NOT REALLY LOOKING FOR ANSWERS TODAY. YOU NEED TO SET THE STAGE FOR OUR INQUIRY -- AN INQUIRY THAT WE INTEND TO PURSUE BY CALLING ALL THE EXPERTISE AND COUNSEL WE CAN FIND, BOTH INSIDE AND OUTSIDE THE PENTAGON. THIS HEARING IS NOT THE END OF OUR INQUIRY, BUT MERELY THE BEGINNING OF A LONG, SERIOUS STUDY. WE APPRECIATE YOUR HELP.

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The CHAIRMAN. Let me at this time recognize the ranking Republican on the Investigations Subcommittee, Larry Hopkins.

STATEMENT OF HON. LARRY J. HOPKINS, A REPRESENTATIVE FROM KENTUCKY

Mr. HOPKINS. Thank you, Mr. Chairman.

I believe that we are poised today to kick off a brand new adventure for this committee. I think if we stick with it and develop the issue properly, close support, at least in my opinion, has the potential to be as important and pivotal an issue for this committee as defense reorganization was in 1985 and 1986.

I think it has a little bit of everything. How we define the requirements which drive our choice of weapons; the touchy issue of roles and missions, which has escaped close scrutiny for over 40 years; how we should structure our forces going into the next century to survive in an increasingly lethal battlefield; and finally, Congress' role in pushing the Pentagon to overcome the bureaucratic inertia which has historically ruled the day on many of these issues.

I think that some, Mr. Chairman, might immediately scream micromanagement, but I believe this is exactly the type of issue which we are uniquely suited to handle, and the Pentagon is institutionally unable to pursue.

After all, we have an opportunity here to serve as honest brokers on one of the most emotionally charged issues facing the military; but to do this job properly, I think we have also to put aside our own preconceived notions. Many of us have strong views on many of the hardware issues that we are going to explore, but the quickest way to sink this effort is for it to become a stalking horse for a particular weapons system or doctrine.

This issue desperately needs an objective, zero-based review and Congress may be the only player up to the job. As a member of both the Investigations and the Procurement Subcommittees, I look forward to working with our chairman and my colleagues on this effort. I sincerely hope that we seize and run with this unique opportunity to restructure our battlefield forces in order to meet the challenges of the future.

Mr. Chairman, thank you.

The CHAIRMAN. Thank you very much. We will proceed now. General Smith, why don't you begin and then we will go to Hans Mark and then John Krings.

STATEMENT OF MAJ. GEN. PERRY SMITH, USAF (RETIRED)

General SMITH. Thank you, sir. Thank you, Mr. Chairman.

I would like to introduce just one person in the audience, my wife, who is sitting directly behind me. I have testified on the Hill many times through the years. This is the first time she has had a chance to witness me in the chair.

Her father, Lt. Col. Jimmy Dyess, U.S. Marine Corps Reserve, was one of the very few Americans in history who was awarded both the Carnegie Medal for Heroism in Peacetime and the congressional Medal of Honor. He was killed on Roi Namur Atoll in the Marshall Islands in February of 1944.

The CHAIRMAN. Welcome to the committee and I hope you enjoy the hearing.

General SMITH. Thank you.

It is a pleasure, Mr. Chairman, to appear once again before your committee. I promise a crisp 20-minute presentation or less. The last time I appeared here was when I was the Director of Plans of the United States Air Force in 1983. Since that time, I have had the time to think deeply about a number of important issues facing our nation.

All three of my recent books have been written in an attempt to help this Nation deal with the problems of leadership, strategic planning, and national decisionmaking, and I brought copies of my hot-off-the-press book, called, "Assignment: Pentagon," and I have enough for the members, I think, thanks to my publisher.

If I have a hidden agenda today, it relates to my writing and publishing. For instance, I am the general editor of a series of books on future warfare; and I would hope that in the years ahead, members of this committee, staffers and others in attendance; will read and study these books.

Having first been introduced to warfare when I was 6 years old on the way to Sunday school in Hawaii in 1941, I have had a lifetime interest in national security. I salute you for addressing an important mission area and I am honored to join Hans Mark and Jack Krings as one of the lead-off witnesses.

I have been asked to be objective in my presentation. I have committed myself to look at the lessons of history with as much candor and honesty as I can muster. Since retirement, I have been an author, a lecturer and a teacher. I have not been a defense consultant.

What I would like to do is make a few basic points about the close air support mission area, share some lessons that I see in history, look at alternative ways the mission can be organized and accomplished, suggest some trends and opportunities for the next 20 years and make some suggestions about how to best proceed with these hearings, to recommend a few books and studies for you and your staff to examine.

First, a few fundamentals. First, war is the most complex of all human endeavors. Second, the farther a nation is removed from the last war, the harder it is to prepare for the next. Third, to be a success, a military campaign must identify and successfully attack an enemy's center of gravity. This is one of Clausewitz' key points and it remains a valid one today. Fourth, in most cases, an air campaign must take the offensive to be successful. Fifth, a commander must think with his brain and not with his heart. Sixth, every mission area must be considered in the context of the overall military campaign. Perfect solutions to individual mission areas in isolation may be dysfunctional to the overall campaign. In other words, optimizing one mission area may detract from others. Seventh, in my considered judgment, there has been, is and will be a mission area known as close air support. In fact, with the advent of Stealth and other new technologies, it may be, in the future, somewhat easier to do this mission even in high-threat environments than it has been in the immediate past.

Now, to some specific points about close air support mission itself. First, two definitions. Number one is from JCS Pub 1, the bible of the Joint Chiefs: "Air attacks against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces." That is the definition that is official.

Another one that I like, I get from John Warden's new book on "The Air Campaign," which I will mention later. "Any air operation that theoretically could and would be done by ground forces on their own if sufficient troops or artillery were available."

In my judgment, close air support is first and foremost the hardest of all air missions. Why? One, it requires very close control. Two, air defenses are often very heavy and very ready. To be near the sounds of guns has a way of concentrating the mind. Three, unlike most air missions, both friendly and enemy forces may shoot you down. Four, pilots must be very careful not to hit friendly forces. Five, targets on the ground tend to be very spread out and hard to find, identify and destroy. Six, to accomplish close air support well usually requires somewhat better weather than other air-to-ground missions in order to maneuver under the weather and find and attack those targets.

Now a few lessons from history. One caution, however. Airmen do not have the rich history of soldiers and sailors to serve as their laboratory for the development of doctrine, the establishment of requirements and the development of weapon systems. In addition, technology often moves faster in the air than it does on the ground and on the sea.

For instance, it is easier to design an operational airborne autonomous vehicle, an RPV, than it would be to build a robot soldier or robot tank. On the other hand, there may have been many experiences in close air support in the past 20 years that will be useful to examine.

Let me just suggest a few. First, a close comparison between the way the German military conducted close air support in 1939 and 1940, compared to the way they conducted it from 1943 to 1945. A second place for a close look. What happened in the fall of 1942, in the western desert of north Africa, when the British finally defeated Rommel, and what happened a few months later in the late fall and winter and early spring of 1943, when the Americans, the free French and the British got rather badly mauled in the Tunisian campaign?

A third area worth examining is how the Russians conducted close air support during World War II and how they balanced air superiority with close air support and how they employed the IL-2, which was probably the best close air support aircraft of World War II.

A fourth general area for examination would be the Israelis and how they conduct the air/land battle and, most specifically, how they conducted close air support in the 1973 war. Studies of the Korean and Vietnam Wars are certainly worthwhile, but a strong caution is in order. If the establishment and maintenance of air superiority is fairly easy, as it was in both Vietnam and Korea, the entire air campaign may be quite different than in a war where air superiority is not assured and where friendly ground and air forces are being hammered periodically by enemy air-to-ground aircraft.

The second major point about close air support is that it has never been clear which military service can best do the job. There has always been, and there will always be a strong debate on this issue. To grapple with this issue of which service or services are assigned to the close air support mission, it may be best to ask the question, what is the combat interest of each of the services and what is the combat interest of the nation.

If, for instance, the Army owns this mission, it is clear that it will do it well. It will develop, procure and deploy aircraft, structure the command and control system and do the training and be prepared for war. The U.S. Marine Corps motto comes to mind. The Marine Corps conducts close air support very well.

However, an Army that owns a close air support mission must keep this in mind, that in extreme battlefield situation, when that Army has used up all its close air support assets and needs help, the Air Force may not be there to lend assistance.

Today, and in the future, the plate of the United States Air Force is and will be very full. If asked to give up the close air support mission, the Air Force will turn its attention to other important missions, including the complex and expensive areas of space. After a few years, the Air Force may be ill-prepared to assist and if the Army, in extremis, calls for help, it may not be there.

As far as the Air Force is concerned, its combat interest in the mission of close air support is not very high. The missions of offensive and defensive counter air and of interdiction and battlefield interdiction are of such vital importance that the Air Force would, in my judgment, rather easily give up this mission if ordered to do so by the Secretary of Defense or the president or directed to do so by law.

One of the reasons the senior leaders of the Army have never been advocates of taking over this mission is they know that through this mission, they have a way of ensuring that Air Force leaders understand close combat and commit themselves to lending support to it.

Goldwater-Nichols rings out loud and clear in this area. The services must be prepared for joint warfare. The services must reduce levels of parochialism, increase their cooperation and enhance mutual trust.

If one of the goals of this committee is to encourage the military services to work, plan and fight in close coordination, then moving the close air support mission to the Army could be a mistake.

A fourth major area of interest is the utility of dedicated close air support aircraft. Again, history may be useful here.

The German Stuka bomber was such an aircraft and it had both great successes and failures in World War II. In my judgment, in times of budgetary plenty, a dedicated close air support aircraft makes good sense. In times of prolonged budgetary austerity, it makes considerably less sense.

As the Chief of Staff of the 2nd Tactical Allied Air Force in northern Germany explained to me in the early 1980s—I was the Ops Officer and this man was a German two-star, who had fought in World War II—he said, "Perry, you Americans are rich. You can afford a dedicated close air support aircraft like the A-10. We Germans cannot. We must be satisfied with a multipurpose fighter that can accomplish a number of missions."

How rich will we be and how much of our precious resources will we be willing to devote to the national defense is fundamental to this question.

A fifth major area worth examining is how do other nations of the world organize, conduct and prioritize this mission? It is my strong view that one of the faults of the military of the United States is that we are too busy to do much thinking. Having lived 11 years in Europe and having debated these issues with military men of many nations and services, I have come to the conclusion that we can learn much from the thinking of those of other nations.

May I suggest that in the course of your hearings, you call on the best and the brightest among the Europeans and among the Israelis. Be sure to examine with them the key issues of command and control, logistic support, electronic measures, both offensive and defensive, both air and ground, and of great importance, the whole issue of air space control.

As I close my remarks, let me make a few more suggestions. If possible, you should examine in some detail all the compartmented programs that relate directly or indirectly to this mission. You should not only ask the technological and operational questions about these programs, but also the doctrinal and organizational questions.

For instance, what role can advanced autonomous vehicles play and who should own and control these vehicles? It is my rather strong view than within the next 20 to 30 years, autonomous vehicles will play a very important role in this mission area.

My next suggestion relates to reading. When I was the Director of Plans on the Air Staff in 1982, I wrote a letter to Dr. Dick Kohn, the Chief Historian of the Air Force, suggesting that he should commission individual histories to examine analytically each of the combat mission areas of the United States Air Force. Happily, the history of close air support is available in manuscript form and the staff has that.

It not only examines the history of close air support from an American point of view, but it also looks at the Germans; it looks at the Israelis; it looks at the Russians and so forth. It is a very thoughtful piece of work.

Dr. Kohn, as I mentioned, has already made that available.

A second book I would recommend, another new book, is a book called, "The Air Campaign," by Colonel John Warden, U.S. Air Force. In my judgment, this is the best book written on air power in the past decade. It is published by the National Defense University Press and I am sure it would be easy to get copies.

The third is a book by Dick Simkin, called, "Race to the Swift," which is a book about warfare in the 21st century by Dick Simkin. It is a very thoughtful piece of work.

A fourth book worth looking at is Dan Mortensen's, "A Pattern for Joint Operations: World War II Close Air Support, North Africa." The North Africa experience and the changing doctrinal pattern there in 1942-1943 is well worth looking at.

Dan did his research for both the Office of Air Force History and the Army Center for Military History.

Finally, Richard Hallion's new monograph, "Battlefield Air Support: A retrospective Assessment."

My penultimate point is as follows: If this committee could encourage the Secretary of Defense to develop and institutionalize a long-range planning system, this Nation would be well-served. Each service does long-range planning, but there is no office, not even one individual in the Secretary of Defense's Office, who is a full-time strategic planner.

In fact, we buy many of our weapon systems as if we were shopping at 7-Elevens on Sunday night. Our thinking and planning is not as bad, but compared to many other nations, we are third-rate at strategic military planning. I have lectured, by the way, in Japan and China and Brazil and London and lots of places and we don't do this very well.

My final point is a caution to this committee. Digging out the lessons of history and adapting them to the challenges of future warfare is hard work. If this committee is going to make a contribution to national defense in this general area of combat missions, it must be willing to devote much time and lots of intellectual energy.

If, in the months ahead, I can assist in this endeavor, please feel free to call upon me.

Thank you very much.

The CHAIRMAN. General Smith, thank you very much for your comments.

Let's listen to Dr. Hans Mark and then John Krings and then we will go to questions, if that is all right.

STATEMENT OF HANS MARK, CHANCELLOR OF THE UNIVERSITY OF TEXAS AND FORMER SECRETARY OF THE AIR FORCE

Dr. MARK. Mr. Chairman, and members of the committee, my name is Hans Mark. I am the Chancellor of the University of Texas System and a professor of aerospace engineering at the University of Texas at Austin.

During the Carter administration, I served as Secretary of the Air Force, and I have spent about 30 years in the business of looking at technology as it applies to various military systems.

I have a prepared statement which I have submitted and I would just like to spend a few minutes summarizing.

The CHAIRMAN. Without objection, the statement will be submitted in the record.

Dr. MARK. I feel a little bit nervous about following a person as distinguished and experienced as Perry Smith. My experience is more in the laboratory and more in the test bed than on the battlefield. So what I say has to be measured in that sense.

I thoroughly agree with General Smith that warfare is the most complex of human activities; and, therefore, it requires a very strong integration of all the necessary factors, starting with command, which is the central and most important function; and then somewhere toward the end, you have technology and the application of technology, which is my business.

I think the most useful thing I can do to contribute to the committee's work is to talk a little bit about what is on the technical horizon, how it may apply to the decisions that you will have to help make and, as General Smith suggested, use a little bit of history to try to buttress the case.

If I look at the technology that is relevant to the question of air support, then I think two things have happened. One is that we have much, much better electronics and that means better computers and better sensors, and by "better," I mean better in the last 10 years. This has been something that is an ongoing thing and happens very rapidly.

The other thing that has happened is that we have managed to learn more about aeronautical technology so that we can now build airplanes and use airplanes and, in fact, have used airplanes in combat that do not need air bases and air fields; that is, airplanes that can operate in environments that don't require a complex support structure. They require logistics, as every other weapon does, but they don't require the air fields and the kind of ground-based facilities that conventional airplanes require.

I think those two technologies, electronics and vertical take-off and landing, are the two things that are going to change how we do the close air support business or the air support business generally in the coming years.

I have also read some of the literature of close air support that General Smith talked about. I don't want to get into definitions. There is close air support; there is battlefield interdiction; there are lots of other things. I think it is important to understand those definitions and important for the military people to deal with them because they are the ones who are going to have to organize this thing, but for folks such as myself, I don't think it is too important.

I like what one retired Army general once said when asked about the difference between a strategic and a tactical target, he said, "The guy with the machine gun 50 yards ahead of me is a tactical target and the ammo carrier 10 yards behind him is a strategic target." I will leave my definitions with that.

What has good electronics done in the last 10 years? I will argue that the advent of things like the Stinger missile really was the decisive factor in the war in Afghanistan. We have had hand-held, anti-aircraft missiles before. What is different about the Stinger, which is a General Dynamics-manufactured, hand-held missile? It weighs about 40 pounds.

The difference is that it has a sensor system and a guidance system that is very much better than anything that has been done in the past, and it is a very fast missile so that it can catch up to airplanes. The Russians, in the last 2 years of the war in Afghanistan, lost over 300 airplanes to these missiles.

These things were held—hand-held—they were operated by people who were not technically very sophisticated; but I think it is an example of recent history where the application of a technology has had a major and decisive effect in an important war.

It made it really impossible for the Russians to operate with relatively low-performance aircraft, because I want to emphasize that the airplanes that were shot down were mostly helicopters and specialized air-to-ground airplanes like the SU-25s, the "Frogfoots", that the Russians used in that campaign.

The lesson there is that it is very dangerous now to fly above a battlefield with lots and lots of people equipped with these missiles. I remind you, also, that a Stinger costs about 50- to $75,000, depending on what you buy with it, and you can shoot $20 million airplanes down with it without too much trouble.

That is one consequence of the development of submicron electronics and of sensors, exquisitely sensitive, solid-state detectors that can pick up and discriminate your targets.

Paradoxically, somehow, it is really that same technology that also improves your ability to do these terribly difficult air-to-ground missions that General Smith talked about with high-performance aircraft.

The point is the following: It is hard to hit small targets on the ground and air support is that kind of an operation.

The sensors, the communications systems, the cooperative—the ability to have cooperative operations with airplanes and ground targets is the thing that makes for a successful air support campaign.

Once again, recent history has some very interesting examples here. In 1982, the Israelis invaded Lebanon—I guess it was the second time—this was the massive invasion of Lebanon. The Syrians had placed a number of surface-to-air missile sites in the Bekaa Valley. The Israelis felt that they had to knock out these sites in order to control the air over Lebanon and they mounted an operation to do it.

They mounted an operation which started out with a very careful intelligence-gathering effort that had to do with pinpointing the locations of the SAM sites. They then, by a series of stand-off air operations, induced the Syrians to turn on their fire-control radars. The Israelis then, from the ground, launched some Shrike-type missiles to kill those radars, and once the radars were gone, they went in with F-16s and knocked out the SAM sites with iron bombs.

It is interesting that they used iron bombs for this, because they wanted to have enough explosive power on the ground to destroy the SAM sites, not just to immobilize them. They really wanted to kill them.

Coordination. Sensors, again. The Shrike missile was a high-tech missile with good discrimination, good sensing, and then an air operation that went in and did a decisive strike with high-performance aircraft that were hard to shoot down with other weapons that the Syrians had around. The Syrians had SA-7s and things like that. An SA-7 is a hand-held missile, like the Stinger that the Russians built, but not as good as a Stinger in terms of guidance and control. They couldn't hit the airplanes with them. They couldn't hit a high-performance aircraft with them.

Another recent example of a close air support war was the one in the Falkland Islands, the war between Britain and Argentina in 1982, over the group of islands there in the south Atlantic.

In that case, the Argentine Air Force really performed some remarkable feats in this area of supporting ground operations or maritime operations with airplanes. Before the war started in April, I guess it was, 1982, the Argentines took delivery of five

French Super Etendard fighters with five Exocet missiles. The Exocet is a smart weapon, taking advantage of the kind of electronic technology that I talked about.

During the course of the war, they fired four of those missiles from the air at British ships. They missed twice and they hit twice, and the two times they hit they sank the ships they hit. Not a bad record. Fifty percent of the missiles they shot hit the targets and sank them.

They also flew old A-4 airplanes, Douglas A-4 attack airplanes. They flew them in from bases in Argentina at extreme range. They came in, and again, because of good intelligence—they had airplanes orbiting above the battlefield—those airplanes spotted the target for them; the A-4s came in and sank several British ships. In fact, if the Argentines had learned how to fuse iron bombs, they would have sunk more British ships than they did.

Again, the airplanes were high-performance aircraft. This is the point. The A-4s are high-performance aircraft. The British could not hit them with their hand-held anti-aircraft weapons, the Blowpipe, and although they did get a lot of them with the Harriers, and I want to come back to that, they did not succeed in preventing the Argentines from mounting very, very serious air attacks on their Navy.

The British lost several ships in San Carlos water and would have lost more, as I have said, if the bombs that hit the ships had actually exploded.

I am inclined to think, as a result of these examples, that the Air Force is on the right track by saying that you should have a ground-attack airplane that has relatively high performance, high maneuverability and is relatively difficult to hit.

If you put that together with good guidance and good control systems on your weapons, then that could be a formidable weapon.

I think another factor that is important is that a high-performance aircraft like the A-16, for example, is a dual-role airplane that can be used for other things. In that it is very much similar to what happened at the end of World War II when we fielded the P-47s and the P-51s and the P-38s. Those airplanes were originally intended also to escort bombers on long-range missions, so we gave them a lot of range; range and payload in an airplane can be traded off. It turned out that they could carry bombs as well as fly long distances. If you did that, rather than put gas tanks on them, those airplanes became very effective air-to-ground airplanes as well. I think the A-16, if you ask me, is in that tradition.

I know I am not supposed to argue specific hardware here, but all I am really saying is that I think the Air Force is on the right track, in view of these technical developments.

Let me just spend a few minutes talking about other technical things, particularly the business of vertical take-off and landing aircraft. I agree with General Smith that the air support mission will get more difficult, and therefore may get, after a while, less important. That is, there may be other missions that require airplanes on the battlefield, rather than just using them to put ordnance on a target, and that those other missions will gain in importance compared to the ordnance-delivery mission. The ordnance-delivery mission is the most dangerous.

In fact, I talked to a senior Army commander not so long ago who told me that he didn't think he would use airplanes in a really high-intensity battlefield. He thought that there were other ways of doing that mission and so the airplanes ought to be used somewhere else.

I am talking here now about transport logistics, medevac, reconnaissance, things that airplanes are used for in other missions, and there, I believe, the flexibility of vertical take-off and landing is going to be important.

We have two airplanes now capable of doing that. One of them is in service, the AV-8B and the other one, the V-22, is just coming on-line. I understand there is going to be a debate before this committee on that issue. If I read the Pentagon Press correctly this morning the V-22 is one of the programs that is up for review and possible delay.

But I would urge the committee to take a close look at this question of the importance of the ability to operate from relatively primitive ground facilities. I have been involved in the V-22 development for 20 years now. I was with NASA for 12 years and one of the big aeronautical projects we had was to develop that technology. I think it has great promise and I would urge you to take a good look at that.

In the case of the Harrier, we have already made the decision to buy them, but again, the British side of the Falkland Islands war is instructive. You have a combat aircraft there which really was, I would say, not decisive, but very important, in keeping the very capable Argentine Air Force at bay while the British were doing the invasion.

The biggest failure in the Falkland Islands war, by the way, was a specialized air-to-ground attack airplane that the Argentines had built, Pucara, the IA-58A. It is a small airplane that the Argentines built for counterinsurgency actually. They had 30 of them deployed in the Falkland Islands at the beginning of the war and all of them were shot down in short order, either shot down or destroyed on the ground. None of them did any real damage and that is because they were terribly vulnerable, again, to these hand-held anti-aircraft weapons, which was, again, the lesson in the Afghanistan war.

To summarize then, Mr. Chairman, I believe that the developments in electronics that make smart, unmanned missiles and weapons possible are going to continue. We have another order of magnitude or two to go in the size of electronic circuitry and in the development of sensors. The commercial world has recognized that, I think, and so has the military world. I think we ought to bet on that and continue to work for better systems of that kind.

At the same time, these systems, as I have already said, will make it possible, in limited circumstances, I personally believe, for manned airplanes to come in and do things that might not be otherwise accomplished in a dual-role airplane of the kind that the A-16 would be. I think that is the right way to do that mission.

Finally, I think the vertical take-off and landing is something that really needs to be exploited by the U.S. military, because I think we are going to be in situations where that might be the only way to get air power into the place where we are in trouble.

I appreciate the opportunity, Mr. Chairman, to appear before this group and I will be happy to answer any questions.

Thank you, sir.

PREPARED STATEMENT OF HANS MARK

Mr. Chairman and members of the Committee, I am Hans Mark, I am the Chancellor of The University of Texas System and a Professor of Aerospace Engineering and Engineering Mechanics at The University of Texas at Austin. During the Carter Administration, I served as Secretary of the Air Force and I also spent twelve years with the National Aeronautics and Space Administration working on aeronautical technology. It is a privilege and a pleasure for me to appear before this Committee.

As in so many other human endeavors, success in war depends on many factors. There must be clear objectives, good organization, esprit de corps, competent command, and the proper application of technology. I am an engineer and have spent more than thirty years working on various facets of technology that are applicable to military missions. I will concentrate on evaluating new technological developments that bear on the problem of air support for ground combat operations. Obviously, the technologies cannot be separated from operational considerations but I want to focus on these technologies because it is by describing what is on the technical horizon that I can probably make the most useful contributions to the Committee's deliberations.

I have studied the literature of tactical air power and air support in some detail over the years. The many mission definitions that exist in that literature are probably necessary. There are missions such as Close Air Support (CAS), Battlefield Air Interdiction (BAI), Deep Interdiction (DI), and several others. These definitions are used for those whose task it is to organize military forces to fight since the various operations must be accurately categorized. It is, therefore, important to understand them, but there is a point at which arguing definitions is not very useful. I actually prefer the view of retired U.S. Army Brigadier General Eugene M. Lynch who replied when asked to explain the difference between "tactical" and "strategic" missions: "To the infantryman, the difference between a tactical and a strategic target is clear-cut. An enemy machine gunner fifty yards away is a tactical target. The ammo carrier lying ten yards behind him is a strategic target."

My own definition of the subject on which you have asked me to talk today is simple: Air support is any air operation conducted in direct support of troops or ships engaged in combat on land or at sea. This definition includes supporting firepower, or supporting transportation for logistics, assault, and evacuation. It includes reconnaissance, medical aid, and many other operations conducted for supporting purposes. My definition is a broad one but I believe it is necessary describe what can effectively be done by aircraft. It is important to keep in mind that the delivery of ordnance is only one of several important functions of air power.

What are the important technological developments that have occurred in the past ten or fifteen years which have either enhanced our ability to perform these missions or which have made them more dangerous? One important development has been in the area of electronics which has made it possible to produce much better fire control systems for many different kinds of weapons. The second has been the development of practical vertical take-off and landing (VTOL) aircraft. Both of these have already played an important role in air support and will, I believe, have increasing influence in the future.

The ability to make compact, highly capable computers and exquisitely sensitive radiation detectors depends on the creation of ever smaller circuit elements and better purifications and control of materials for detection devices. We can now make microchips in the sub-micron size range and detection and discrimination technology has advanced rapidly as our understanding of the physics of the solid state has expanded. These developments have resulted in several generations of "smart weapons" that have been created since the end of World War II. These weapons have made air operations above a battlefield more dangerous because it is now possible to shoot down airplanes with small but very sophisticated hand held weapons. Examples of these are the British "Blow Pipe," the Russian SA-7 and its successors and, of course, the highly successful Stinger missile system (FIM-92 A&B) produced in this country by General Dynamics Corporation. All of these weapons use high performance missiles guided by excellent electronic systems. There should be no doubt that these weapons have been effective in many situations and even decisive in some. The use of the Stinger missile by Afghan resistance fighters is particularly instructive.

The Stinger (FIM-92 A&B) is a hand held anti-aircraft weapon which was given to the Afghan resistance fighters in 1986. Prior to that time, the resistance fighters had other hand held surface to air missiles such as "Blow Pipes" and SA-7's but it was the Stinger that proved to be decisive. The main technical feature of the Stinger is that it is "smarter" than its predecessors. It has excellent discrimination systems and anti-decoy sensors and it is also simple to operate. As a consequence of providing Stinger missiles to the Afghan freedom fighters, the Russians lost more than 300 aircraft to these weapons in the last two years of the conflict. The aircraft they lost were mostly "low performance" vehicles such as the helicopter gunships (Mil Mi-24 Hind A and D) fielded in Afghanistan and the SU-25 Frogfoot attack aircraft, which is the Russian equivalent of the American Fairchild A-10. It is, I submit, not an exaggeration to say that the Stinger was the decisive weapon in the Afghan war. It was the loss of air superiority by the Russians that I believe finally caused them to withdraw their military forces from that unhappy land. For those who like to look at history, the Stinger may have had the same decisive effect that the English longbow had at the battles of Crecy (1346) and Agincourt (1415) in which the English yeomanry defeated the French knighthood using this new technical development.

The Stinger missiles are, of course, not as effective against very high performance aircraft as they were against those that the Russians had deployed in Afghanistan. In the case of airplanes that are both fast and maneuverable, the fire control problem faced by the Stinger missile system is considerably more difficult. However, it is well known that with high performance aircraft, it is very much harder to see targets on the ground, much less hit them, because of the short time available for the pilot of the aircraft and his collaborators on the ground to identify and strike the target. Paradoxically, the same technology that makes the Stinger missile possible also makes it possible to use very high performance aircraft in air support missions with the objective of accurately delivering ordnance to targets on the ground. High performance aircraft have the advantage that they are less vulnerable, but to use these aircraft effectively, they must carry "smart" weapons and there must be excellent fire control and communications systems in order for them to work cooperatively with people on the ground or with other reconnaissance systems.

Two recent examples served to illustrate what I mean by these statements. In 1982, Israel invaded Lebanon. The Beka'a Valley runs north and south parallel to the Mediterranean coast and it was occupied by the Syrians when the troubles in Lebanon began during the 1970's. The Syrians deployed a great many surface to air missiles in the Beka'a Valley in order to maintain control of the air above a region in which there were many clashes between Israeli forces and Palestinian units in the area. Having decided upon the invasion, it was therefore important for Israel to deal with these surface to air missiles. In what has become a classic operation, the Israelis first deployed unmanned intelligence drone vehicles to accurately pinpoint the positions of the missile sites. They then used some air missions to cause the Syrians to turn on their fire control radars which the Israelis promptly destroyed with ground based radiation seeking (Shrike type) missiles. Finally, they flew a great many sorties with their General Dynamics F-16 fighter-bomber aircraft and destroyed all of the surface to air missile sites with gravity bombs. Gravity bombs were used in this case because they had enough of an explosive charge, in contrast to rockets, so that they would destroy the SAM sites rather than just damage them. This operation was remarkably successful and it illustrates that a combination of good intelligence, smart weapons, and then rapid follow through is essential for successful air support operations of this kind.

Another war was fought in 1982 over the possession of the Falkland Islands in the South Atlantic in which Argentina and Great Britain were the contestants. In this conflict, the Argentine Air

Force and Argentine Naval Aviation forces illustrated that imaginative use of "smart weapons" and of high performance aircraft against ships could have devastating effects. Immediately before the hostilities began, the Argentine Navy had taken delivery of five French built Dessault Super Etendard attack aircraft armed with the "smart" Exocet missile. In spite of the short time available for training their naval aviators, the Argentinian pilots made a remarkable record with these weapons. With five weapons in hand and four used during the conflict in air to surface missions, two hit the ships they were aimed at and sank them. One was the destroyer "H.M.S. Sheffield" and the other was a civilian cargo carrying vessel used to supply the British task force, the "Atlantic Conveyor." Just as in the case of the employment of Stinger missiles by the Afghan freedom fighters that I discussed earlier, "high technology" weapons such as the Exocet proved to be extremely effective. In this case also the weapons carrier, the Super Etendard attack aircraft is a high performance airplane which can approach the target and get away quickly.

The Argentine Air Force also used its aging American built Douglas A-4 attack aircraft with great effect against the British Navy. In this case they employed tactics somewhat similar to those of the Israelis in the example of the Beka'a Valley except that they did not do an effective job at defense suppression. The A-4 is a high performance aircraft and the Argentinians vectored them to their targets, which were mainly British warships, by using orbiting aircraft at high altitudes to do the spotting over the battlefield. The Argentine Air-Force pilots pressed home their attacks with remarkable courage and scored many hits on British ships. They had serious problems fuzing their gravity bombs so that many of the bombs that hit British ships did not explode. In spite of this problem, they did succeed in sinking several British warships. In this instance also, good intelligence about target location proved to be exceedingly important.

There is one final comment that I would like to make about the Falkland Islands conflict. The Argentine Air Force at the beginning of the conflict possessed approximately sixty IA-58A Pucara counter-insurgency aircraft. This airplane is a small (15,000 pounds maximum weight), relatively low performance turbo prop machine designed primarily to deal with relatively soft targets on the ground. It carries a significant bomb load (3,600 pounds) and has excellent loiter capability. About thirty Pucara aircraft were deployed to the Falkland Islands by Argentine because they were the only Argentine combat airplanes able to operate from the air strips available on the islands. The Argentine high command therefore believed them to be important. As things turned out, the Pucaras proved to be extremely vulnerable to the same kind of hand held anti-aircraft weapons that decimated somewhat similar Russian airplanes later on in Afghanistan. All of the Pucara aircraft that the Argentines had deployed to the Falklands were either shot down or destroyed on the ground in short order.

What can be concluded from all of this? First, is the fact that air space above a battlefield in the 1980's has become much more dangerous than it was a decade ago. Thus, the air support operations that involve the delivery of ordnance will probably become less important in relatively high intensity battles because of aircraft vulnerably. Not long ago, a senior U.S. Army officer with combat command responsibilities told me that he would probably not use any airplanes in a really high intensity engagement because of the very high risk of failure of the mission.

The second conclusion is that high performance aircraft and/or "smart" stand off weapons can produce devastating results to ground or ship targets when the aircraft are properly handled. This statement may seem to contradict my first conclusion, but it is less contradictory if the accent is on "high performance." There is simply no doubt that the fire control problem for anyone trying to shoot down such an airplane is more difficult than it would be for an aircraft with low performance characteristics.

My educated guess, therefore, is that the Air Force is right when it advocates a derivative of the General Dynamics F-16, the A-16, for the air to ground support role. It is the best small combat aircraft that we have and the modifications proposed are simple and inexpensive. The A-16 would have plenty of payload capability, it would be highly maneuverable and most important, it would be capable of assuming a dual role both as a ground attack aircraft and as an air superiority fighter. By adopting this position, we would be following the grand tradition established in the final years of World War II of using the Republic P-47's, the North American P-51's, and the Lockheed P-38's both as fighters and as bombers. I remember that the term "swing role" was coined to describe the dual mission of these aircraft. I would hope very much that the Committee will eventually support the position taken by the Air Force on this most important matter.

Having said all of this, I now want to turn to another topic that may put what I have said in better perspective. While the delivery of ordnance on ground or ship targets is important, I would argue that it is no more important -- and may even be less important -- than use of air support in other areas such as reconnaissance, medical evacuation, rescue, logistics, and transport. Even under the best of circumstances, and with the best technology, the delivery of ordnance on targets by aircraft is a risky and probably a high cost business. Long range rockets with good guidance systems and even terminally guided artillery shells are probably a cheaper and more effective way of accomplishing the same objective. Given the high intensity of modern ground war, it is not at all clear whether anyone will have enough airplanes left to have a really decisive effect in such a situation.

What about the other missions that constitute air support for combat troops on the ground or on ships at sea? Are there new technologies on the horizon that might be useful for these? I would submit that there is one development going on now that could have a potentially decisive effect on air support and this is the Vertical Take-off and Landing aircraft. In this connection, I believe that it is the tilt-rotor concept as applied in the Bell V-22 "Osprey" aircraft that is particularly promising. The V-22 has the potential to perform air support missions that cannot now be carried out by existing aircraft. The V-22 Osprey is a relatively large aircraft with a gross weight of more than 40,000 pounds. It was derived from the much smaller (15,000 pounds) Bell XV-15 experimental tilt-rotor aircraft that was developed and flown during the decade of the 1970's. I was heavily involved in the XV-15 project during my service as Director of the NASA-Ames Research Center in California. The XV-15 was originally intended as a prototype for a medical evacuation aircraft and was funded jointly by NASA and the U.S. Army. The idea was to create an airplane that could land and take-off like a helicopter but that once it had lifted off the ground could be converted to conventional flight by tilting the rotors of the wing-tip mounted engines in such a way that they become propellers. The result of this is an aircraft that has the range and speed of a conventional turbo-prop and the ability to operate independently of ground facilities just as a helicopter. In the case of medical evacuation, the advantages are obvious to us since an aircraft like this has the speed and range to carry casualties to facilities much farther away from the fighting than conventional helicopters.

The tilt-rotor aircraft has an additional technical advantage over the helicopter which is that it does not experience the same vibrational loads when flying. Since helicopters depend on the action of the rotors to keep them airborne, these vibrations cannot be avoided. Moreover, they get worse as the airplane's speed increases. Vibratory loads of this kind lead to high maintenance costs if high failure rates are to be avoided. It is very likely that the tilt-rotor aircraft will eventually be a substantial improvement over helicopters for a large number of air support missions. In the case of the V-22 Osprey, the U.S. Marine Corps has recognized the advantages that I have just listed and has decided to replace the currently operating troop carrying helicopters with this new aircraft. It is my belief that many other air support missions both land and at sea will be found for the V-22. Troop transport and medical evacuation have already been mentioned and I would add rescue, and tactical logistical support as other missions that are most promising. The V-22 project is one that must be pushed with all deliberate speed and I would hope very much that the Committee will support the continuation of this most important program.

Mr. Chairman, in the past few minutes I have tried to define some technological trends that will influence the air support mission in significant ways in the future. Developing and applying these new technologies in the proper way with appropriate military doctrines and relevant organizations will be important in any future military confrontations that we might face around the world. Mr. Chairman and members of the Committee, I thank you for your attention and I would be pleased to answer any questions that you might have at this time.

The CHAIRMAN. Dr. Mark, thank you very much.

Let's hear from Jack Krings and then we will go to questions for everybody.

Mr. DICKINSON. Mr. Chairman.

The CHAIRMAN. Yes.

Mr. DICKINSON. If I might proceed out of order, because I think you have to leave, too. We have a meeting.

But let me ask a question of Secretary Mark. We have two things facing us right now dealing with the VSTOL, the V-22 rotary wing versus A-16, and whatever the powers that be might ultimately decide.

The A-16, as I understand it, will only be serviceable or effective if you can hand off a target, some vehicle has to spot a target and hand it off, so that a high-performance, high-velocity, high-speed aircraft can come in and then deliver ordnance on target, as opposed to a rotor wing that doesn't require the hand-off because it can be there, can loiter and so forth.

Could you just discuss one versus the other briefly before I have to leave, because I think this is something that this committee is going to have to sign off on. What is the state of the art? Is the likelihood of the hand-off—acquisition and hand-off—is that near enough in-hand so that we can go with the A-16 or should we go with some version of a LHX or whatever?

I would appreciate your thoughts on that.

Dr. MARK. What you are trading off here is the vulnerability of the aircraft against the difficulty of hitting the target. I think that the historic examples I have cited would lead me in the direction of opting for a high-performance aircraft and then relying on the command structure that you set up to do that kind of a job that you are talking about.

The examples of the last 10 years and the three examples—there are really two examples that are important, the Falkland Islands and the Afghanistan experience, both indicate that those airplanes don't last. You can't use them.

The hand-held anti-aircraft weapons are sufficiently good that you probably are dealing with the situation where those airplanes won't survive.

Now, I have to underline probably, because I did not go to Afghanistan. I was not in the Falklands. I didn't watch this; I didn't know what you could have done to do it better. I am not sure the Argentines operated their Pucaras very well. What I do know is they got shot down.

I think that is the way I would answer the question. I would opt for the A-16 with a system that allows you to hit targets.

Mr. DICKINSON. If the capability is close enough in hand that they could have a hand-off target acquisition system—and I don't know if we have that now—but I do know that the Israelis have determined for themselves at least that you can't jink around. You can't come in low and slow and the A-10 is not going to make it. You have to come in right up to the firewall as fast as you can, deliver it and get out of there because they are going to knock you out of the air if you don't.

So the opposite being a helicopter where, if the terrain is permissible, you can mask it and you don't have to come in so fast and you can—like AHIP, you can mask yourself, identify a target, pop up, shoot, or lase it and somebody else can hit it.

That is what we are going to be——

Dr. MARK. I think Perry Smith said it correctly. A very close study of what happened in Afghanistan is what I would suggest, because that is really a case study of how relatively cheap anti-aircraft weapons really destroyed the other guy's air superiority and that happened. I mean, it is history. I don't know how much we know about it, but I would urge you to find out whatever is on the record on that score.

Mr. DICKINSON. Thank you, Mr. Chairman.

Mr. RAY. [presiding.] Thank you.

Mr. Krings, I think we are going to be hearing from you next.

STATEMENT OF JOHN KRINGS, DIRECTOR, OPERATIONAL TEST AND EVALUATION, DEPARTMENT OF DEFENSE

Mr. KRINGS. Mr. Chairman, and members of the joint committees, I am here to discuss the close air support operational test plan concept. I do have a written statement for the record and I request that it be entered into the record.

Mr. RAY. Without objection, and you may proceed, sir.

Mr. KRINGS. Thank you.

I would like to summarize my statement a little bit but I would like to first add that I think Perry Smith's assessment that we just heard is the most comprehensive approach to the whole problem in one document that we have seen for a long time.

Number one, from everything that we have seen up to this point, he is absolutely right. He has a very neutral objective view of it and I would strongly suggest that you pursue most of the things that he has recommended because it is clearly one of the most neutral, knowledgeable approaches to the subject that I have seen in a long time. It certainly embodies all the questions and it certainly is the best process to the answer.

So I would strongly endorse you looking at it because it is a very knowledgeable and objective approach. He really understands it, so I would listen to anything he had to say.

You asked me to prepare a competitive fly-off of alternative aircraft for the close air support or CAS mission. The completed test plan was provided to the Congress on the 31st of March, as you requested. It was a test plan created by what we think are a group of experts in our organization, who are with me today. Col. John Benson of the Army is a helicopter pilot, a test pilot, an operational pilot in the Army; Dr. Ernie Seglie is our scientific advisor and he is probably the most experienced tester in close air support and air defense that we have in this country. He was involved in the Sergeant York test, ADATs test, PMS test and many other tests in the past.

We had with us Col. Don Brown, who was a former A-10 Air Force pilot, who had firsthand experience in close air support. I started doing close air support in 1954, as an Air Force pilot and did it on and off in many and varying better and worse airplanes for about 30 years, so I have been doing CAS for 30 years myself.

We certainly sympathize with the General's description of the difficulty. One thing I might add at this point, with this team that we had of experts, we came up with all the answers, too. So could all of you come up with the answers. We all have biased answers, based on our history and where we come from.

The problem is it is biased by the past, what we were involved in or what we did in the past. So, clearly, this panel that set down the test, we could also come up with answers, but they are no better than your answers because I am sure every one of you have an answer to CAS, too.

The question is, which is the one that works best for the customer, the guy who is on the ground who really needs the CAS?

So we proposed a sequence of two tests that will allow an unbiased assessment of each alternative as they perform the CAS mission against a common threat and target base.

They will be evaluated across a wide range of tactical situations from low to high intensity. The first test will be a quick look, limited set of trials that could be flown within 12 to 18 months to decide which aircraft should not be modified for competitive fly-off. This can be conducted using current or surrogate aircraft without investing in production-representative versions of each alternative.

Test aircraft will be the A-10, the A-7, used as a potential surrogate for a re-engined A-10 and the A-16, which will clearly be the F-16 in the meantime. The test is modular in design. Other aircraft types may be directed to participate with an associated increase in cost and time.

The test will emphasize day close air support operations while providing an opportunity to explore night operations. There is currently no night fixed-wing CAS capability.

The trials will be based on three tactical situations in the central European scenario. This early operational test, planned for Fort Hood, Texas, will measure the candidate's effectiveness in killing assigned targets, in addition to their ability to survive in getting to the target and returning to their base.

The estimated cost of the Phase I test is $45 million in fiscal year 1990 and $5 million in fiscal year 1991. Given the large ground forces required for this test and the use of an operational Army post as the test site, I have recommended that the Army, as the users and the recipients of CAS, should assume responsibility for this test. They have clearly done the most CAS-like testing in the last few years also.

Evaluation of the test results will be performed by my office. We have had a unique insight to the other side of CAS. In the last few years, we have been involved in forward area air defense, Sgt. York tests, et cetera, so we have certainly been involved in looking at the Army's side of defending against threat CAS, and we have obviously used the United States Air Force and the Air National Guard and others to be the so-called red attack force.

So evaluation and testing of ground defenses against threat CAS has been done quite a bit recently.

Obviously, any selection of aircraft as a result of these tests would clearly be the responsibility of the Air Force.

The Phase II Competitive Fly-off test will be a side-by-side comparison of designated alternative aircraft with advanced systems in a comparable state of maturity. The test articles would be selected by the Secretary of Defense. According to Air Force estimates, it will take approximately 42 months after the completion of the first test to modify and flight-qualify potential candidate aircraft for this test.

This test will emphasize night and limited-visibility operations in a robust combat environment. This second set of trials will be based on the nine tactical situations associated with Central European, Middle East, Southwest Asian, and Central and South American scenarios described in the plan.

Relative effectiveness will be determined against the users' requirements of responsiveness, effectiveness in killing assigned targets and survivability. The estimated cost of Phase II test is $75 million over the fiscal year 1992–1995 time span.

Current legislation prohibiting contractor involvement in operational testing may significantly delay the start dates for both tests. We will continue to work with you to address this issue as it pertains to this and other operational tests.

Realistic operational scenarios are critical to the credibility of the test. Visits were made to a number of CAS user organizations with Army, Air Force, Marine Corps and NATO personnel. Discussions focused on the process by which calls for fire support were eventually translated into requests for CAS.

We confirmed the tactical situations selected for the test and identified the type and approximate locations of targets that would likely be attacked by CAS aircraft. These visits to these organizations enabled the development of realistic scenarios for the test.

I believe that man-in-the-loop simulation will play a major role in the planning and conduct of both tests. It will assist in the design of the tests and could serve as an important adjunct to the test execution. Manned simulation has the potential to save valuable resources in these tests, as well as other tests.

This plan was developed in consultation with the Army Operational Test and Evaluation Agency, the Air Force Operational Test and Evaluation Center and the Marine Corps Test and Evaluation Activity. In addition, General Glenn Otis, former commander in chief of the U.S. Army, Europe, served as an advisor to provide me a separate assessment of our plan.

During the preparation of this plan, I discussed its content with the Chiefs of Staff of the Army and the Air Force and the Vice Chairman of the Joint Chiefs of Staff. Service and JCS comments were solicited and incorporated where appropriate. Suggestions were also received from principal staff members within the Office of the Secretary of Defense.

Concerns were raised during our dialogue with these agencies, obviously. One, it was asserted that the test would not be valid if it did not address battlefield air interdiction, or BAI. The Congress focused our test planning efforts on the CAS mission. A multi-role aircraft with CAS as a primary mission must be capable of performing CAS effectively, in addition to any other mission that the aircraft might have.

The second assertion was that conducting the test would delay fielding an aircraft. I don't believe that the test delays any current acquisition program. The Phase I test offers the opportunity to look at several basic issues relating to CAS; that is, trade-offs between speed, agility, altitude, size and survivability in an unbiased assessment. The results can only aid in the selection of the correct solution.

The Phase II test could actually be conducted in conjunction with the operational test that would be performed on the selected aircraft.

It was also asserted that the wrong service was selected to conduct the test. You can imagine what service might have asserted that.

I recommend that the Army plan and conduct the test based on the large number of ground forces, the proposed use of Fort Hood, and the fact that Army ground forces are the primary users of CAS. They are the customers.

It was also asserted that the AV-8B should be in the Phase I test. A night attack version of the AV-8B is about to be fielded. This aircraft would not require major modifications to be a participant in a competitive fly-off.

To keep the cost and duration of the test as low as possible, the AV-8B was not included. However, the test is modular in design and additional aircraft may be directed to participate with the associated increase in cost and time.

It was asserted that the instrumentation required to accurately measure engagements is not currently available.

The instrumentation in the services for this type of testing is not as capable as we would like it to be. Ongoing tests right now suffer from this limitation. We have recognized this problem and have attempted to correct it.

We proposed a Capabilities Improvement Program that included funds specifically addressing this current instrumentation deficiency. To date, these funds have not been released. I would strongly urge that the 1989 funds be released immediately to allow us to prepare for this CAS test and to accomplish other important upcoming tests.

Our plan is not without limitations, some that can be overcome and some that can't, but our report faithfully expresses them, up front. We can execute a test that will answer the CAS questions proposed to us.

In summary, our challenge was to design a test that would accurately reflect the environment where CAS will be performed. I feel confident we have done so.

Thank you, Mr. Chairman, I will try to answer any questions you might have.

PREPARED STATEMENT OF HON. JOHN E. KRINGS

OPENING REMARKS

MR. CHAIRMAN, MEMBERS OF THE JOINT SUBCOMMITTEES, I AM HERE TO DISCUSS THE CLOSE AIR SUPPORT OPERATIONAL TEST PLAN CONCEPT.

YOU TASKED ME TO PREPARE AN OPERATIONAL TEST PLAN FOR A COMPETITIVE FLY-OFF OF ALTERNATIVE AIRCRAFT FOR THE CLOSE AIR SUPPORT, OR CAS, MISSION. THE COMPLETED TEST PLAN WAS PROVIDED TO CONGRESS ON MARCH 31.

I PROPOSE A SEQUENCE OF TWO TESTS THAT WILL ALLOW AN UNBIASED ASSESSMENT OF EACH ALTERNATIVE, AS THEY PERFORM THE CAS MISSION AGAINST A COMMON THREAT AND TARGET BASE. THEY WILL BE EVALUATED ACROSS A WIDE RANGE OF TACTICAL SITUATIONS FROM LOW TO HIGH INTENSITY.

THE FIRST TEST WILL BE A QUICK-LOOK, LIMITED SET OF TRIALS, THAT COULD BE FLOWN WITHIN 12 TO 18 MONTHS, TO DECIDE WHICH AIRCRAFT SHOULD NOT BE MODIFIED FOR A COMPETITIVE FLY-OFF. THIS TEST CAN BE CONDUCTED USING CURRENT OR SURROGATE AIRCRAFT WITHOUT INVESTING IN PRODUCTION REPRESENTATIVE VERSIONS OF EACH ALTERNATIVE. TEST AIRCRAFT WILL BE THE A-10, THE A-7 (AS A POTENTIAL SURROGATE FOR A RE-ENGINED A-10) AND THE A-16. THE TEST IS MODULAR IN DESIGN. OTHER AIRCRAFT TYPES MAY BE DIRECTED TO PARTICIPATE WITH AN ASSOCIATED INCREASE IN COST AND TIME. TESTS WILL EMPHASIZE DAY CAS OPERATIONS, WHILE PROVIDING AN OPPORTUNITY TO EXPLORE NIGHT OPERATIONS. THEY WILL BE BASED ON THE THREE TACTICAL SITUATIONS IN THE CENTRAL EUROPEAN SCENARIO. THIS EARLY OPERATIONAL TEST, PLANNED FOR FT. HOOD, TEXAS, WILL MEASURE THE CANDIDATES' EFFECTIVENESS IN KILLING ASSIGNED TARGETS, IN ADDITION TO THEIR ABILITY TO SURVIVE IN GETTING TO THE TARGET AND RETURNING TO THEIR BASE. THE ESTIMATED COST OF THE PHASE I TEST IS $45M IN FY90 AND $5M IN FY91.

GIVEN THE LARGE GROUND FORCES REQUIRED FOR THIS TEST AND THE USE OF AN OPERATIONAL ARMY POST AS A TEST SITE, I HAVE RECOMMENDED THAT THE ARMY, AS THE USERS OF CAS, SHOULD BE RESPONSIBLE FOR THE DETAILED PLANNING AND EXECUTION OF THIS TEST. EVALUATION OF THE TEST RESULTS WILL BE PERFORMED BY MY OFFICE. OBVIOUSLY, ANY SELECTION OF AIRCRAFT IS THE RESPONSIBILITY OF THE AIR FORCE.

THE PHASE II COMPETITIVE FLY-OFF TEST WILL BE A SIDE-BY-SIDE COMPARISON OF DESIGNATED ALTERNATIVE AIRCRAFT WITH ADVANCED SYSTEMS IN A COMPARABLE STATE OF MATURITY. THE TEST AIRCRAFT WOULD BE SELECTED BY THE SECRETARY OF DEFENSE. ACCORDING TO AIR FORCE ESTIMATES, IT WILL TAKE APPROXIMATELY 42 MONTHS AFTER COMPLETION OF THE FIRST TEST TO MODIFY AND FLIGHT QUALIFY POTENTIAL CANDIDATE AIRCRAFT FOR THIS TEST. THIS TEST WILL EMPHASIZE NIGHT AND LIMITED VISIBILITY OPERATIONS IN A ROBUST COMBAT ENVIRONMENT. THE TRIALS WILL BE BASED ON THE NINE TACTICAL SITUATIONS ASSOCIATED WITH THE CENTRAL EUROPEAN, MIDDLE EAST/SOUTHWEST ASIAN AND CENTRAL/SOUTH AMERICAN SCENARIOS DESCRIBED IN THE PLAN. RELATIVE EFFECTIVENESS WILL BE DETERMINED AGAINST THE USER'S REQUIREMENTS OF RESPONSIVENESS, EFFECTIVENESS IN KILLING ASSIGNED TARGETS AND SURVIVABILITY. THE ESTIMATED COST OF THE PHASE II TEST IS $75M OVER FY92-95.

CURRENT LEGISLATION PROHIBITING CONTRACTOR INVOLVEMENT IN OPERATIONAL TESTING MAY SIGNIFICANTLY DELAY THE START DATES FOR BOTH TESTS. WE WILL CONTINUE TO WORK WITH YOU TO ADDRESS THIS ISSUE AS IT PERTAINS TO THIS AND OTHER OPERATIONAL TESTS.

REALISTIC OPERATIONAL SCENARIOS ARE CRITICAL TO THE CREDIBILITY OF THESE TESTS. VISITS WERE MADE TO A NUMBER OF CAS USER ORGANIZATIONS WITH ARMY, AIR FORCE, MARINE CORPS AND NATO PERSONNEL. DISCUSSIONS FOCUSED ON THE PROCESS BY WHICH CALLS FOR FIRE SUPPORT WERE EVENTUALLY TRANSLATED INTO REQUESTS FOR CAS. WE CONFIRMED THE TACTICAL SITUATIONS SELECTED FOR THIS TEST, AND IDENTIFIED THE TYPE AND APPROXIMATE LOCATION OF TARGETS THAT WOULD LIKELY BE ATTACKED BY CAS AIRCRAFT. THESE VISITS ENABLED THE DEVELOPMENT OF REALISTIC SCENARIOS FOR THE TESTS.

I BELIEVE THAT MAN-IN-THE LOOP SIMULATION WILL PLAY A MAJOR ROLE IN THE PLANNING AND CONDUCT OF BOTH TESTS. IT WILL ASSIST IN THE DESIGN OF THE TESTS AND COULD SERVE AS AN IMPORTANT ADJUNCT TO TEST EXECUTION. MANNED SIMULATION HAS THE POTENTIAL TO SAVE VALUABLE RESOURCES IN THESE TESTS.

THIS PLAN WAS DEVELOPED IN CONSULTATION WITH THE ARMY OPERATIONAL TEST AND EVALUATION AGENCY, THE AIR FORCE OPERATIONAL TEST AND EVALUATION CENTER AND THE MARINE CORPS TEST AND EVALUATION ACTIVITY. IN ADDITION, GENERAL GLENN OTIS, FORMER COMMANDER-IN-CHIEF, U.S. ARMY, EUROPE, SERVED AS AN ADVISOR TO PROVIDE ME A SEPARATE ASSESSMENT OF OUR PLAN.

DURING THE PREPARATION OF THIS PLAN, I DISCUSSED ITS CONTENT WITH THE CHIEFS OF STAFF OF THE ARMY AND THE AIR FORCE AND THE VICE CHAIRMAN, JOINT CHIEFS OF STAFF. SERVICE AND JCS COMMENTS WERE SOLICITED AND INCORPORATED WHERE APPROPRIATE. SUGGESTIONS WERE ALSO RECEIVED FROM PRINCIPAL STAFF MEMBERS WITHIN THE OFFICE OF THE SECRETARY OF DEFENSE.

CONCERNS WERE RAISED DURING OUR DIALOGUE WITH THESE AGENCIES:

I. IT WAS ASSERTED THAT THE TEST WOULD NOT BE VALID IF IT DID NOT ADDRESS BATTLEFIELD AIR INTERDICTION (BAI).

CONGRESS FOCUSED OUR TEST PLANNING EFFORTS ON THE CAS MISSION. A MULTI-ROLE AIRCRAFT WITH CAS AS A PRIMARY MISSION MUST BE CAPABLE OF PERFORMING CAS EFFECTIVELY, IN ADDITION TO ANY OTHER MISSIONS.

2. IT WAS ASSERTED THAT CONDUCTING THE TEST WOULD DELAY FIELDING AN AIRCRAFT.

I DO NOT BELIEVE THE TEST DELAYS ANY ACQUISITION PROGRAM. THE PHASE I TEST OFFERS THE OPPORTUNITY TO LOOK AT SEVERAL BASIC ISSUES RELATING TO CAS, I.E., TRADEOFFS BETWEEN SPEED, ALTITUDE, AGILITY, SIZE AND SURVIVABILITY, IN AN UNBIASED ASSESSMENT. THE RESULTS CAN ONLY AID IN THE SELECTION OF THE CORRECT SOLUTION. THE PHASE II TEST CAN ACTUALLY BE CONDUCTED IN CONJUNCTION WITH THE OPERATIONAL TEST THAT WILL BE PERFORMED ON THE SELECTED AIRCRAFT.

3. IT WAS ASSERTED THAT THE WRONG SERVICE WAS SELECTED TO CONDUCT THE TEST.

I RECOMMENDED THAT THE ARMY PLAN AND CONDUCT THE TEST BASED ON THE LARGE NUMBER OF GROUND FORCES, THE PROPOSED USE OF FT. HOOD, AND THE FACT THAT ARMY GROUND FORCES ARE THE PRIMARY USERS OF CAS.

4. IT WAS ASSERTED THAT THE AV-8B SHOULD BE IN THE PHASE I TEST.

A NIGHT ATTACK VERSION OF THE AV-8B IS ABOUT TO BE FIELDED. THIS AIRCRAFT WOULD NOT REQUIRE MAJOR MODIFICATIONS TO BE A PARTICIPANT IN A COMPETITIVE FLY-OFF. TO KEEP THE COST AND DURATION OF THE TEST AS LOW AS POSSIBLE, THE AV-8B WAS NOT INCLUDED. HOWEVER, THE TEST IS MODULAR IN DESIGN AND ADDITIONAL AIRCRAFT MAY BE DIRECTED TO PARTICIPATE WITH THE ASSOCIATED INCREASE IN COST AND TIME.

5. IT WAS ASSERTED THAT THE INSTRUMENTATION REQUIRED TO ACCURATELY MEASURE ENGAGEMENTS IS NOT CURRENTLY AVAILABLE.

THE INSTRUMENTATION IN THE SERVICES FOR THIS TYPE OF TESTING IS NOT AS CAPABLE AS WE WOULD LIKE IT TO BE. ONGOING TESTS SUFFER FROM THIS LIMITATION. WE HAVE RECOGNIZED THIS PROBLEM AND HAVE ATTEMPTED TO CORRECT IT. I PROPOSED A CAPABILITIES IMPROVEMENT PROGRAM THAT INCLUDES FUNDS SPECIFICALLY ADDRESSING THIS CURRENT INSTRUMENTATION DEFICIENCY. TO DATE THESE FUNDS HAVE NOT BEEN RELEASED. I STRONGLY URGE THAT THESE FY89 FUNDS BE RELEASED IMMEDIATELY TO ALLOW US TO PREPARE FOR THIS CAS TEST AND TO ACCOMPLISH OTHER IMPORTANT UPCOMING TESTS.

IN SUMMARY, OUR CHALLENGE WAS TO DESIGN A TEST THAT WOULD ACCURATELY REFLECT THE ENVIRONMENT WHERE CAS WILL BE PERFORMED. I FEEL CONFIDENT THAT WE HAVE DONE SO.

THANK YOU, MR. CHAIRMAN. I WOULD BE GLAD TO ANSWER ANY QUESTIONS YOU AND THE MEMBERS OF THE SUBCOMMITTEES HAVE.

Mr. Ray. Thank you, Mr. Krings.

If Major Smith and Dr. Mark would like to join Mr. Krings at the table, we will then proceed with questions.

Mr. Mavroules, do you have any questions?

Mr. Mavroules. I do have, Mr. Chairman. Let me thank all three witnesses for excellent testimony here this afternoon. I would like to repeat one more time that, between the chairman, Mr. Aspin, and my committee, we will continue the so-called inquiry for more information during a long period of time. We just want to get something moving for a good dialogue.

I just have two questions. Number one, because the fixed-wing is quite expensive and getting far more expensive, what is the best use for a fixed-wing aircraft with relation to close air support and again, with regard to a small target such as a tank or a couple of tanks or a nest of big guns? Or are we going to go into the back areas and knock out something a lot bigger? I think that is a consideration that we must make as we go along.

Does anybody have any ideas along those lines, because of the cost of the fixed-wing aircraft?

Mr. Krings. There probably isn't anybody who doesn't have some ideas along that line.

Mr. Mavroules. All right.

Mr. Krings. I guess the competition for the ideas is the key that you are looking at and that is, rather than ideas, do they really work? Truthfully, I think that I would give you a biased opinion from my view, as most others would.

I think, actually, Perry's view is probably the most neutral one.

General Smith. Thank you.

The way I like to look at a question like that is to try to do what Herman Kahn would ask you to do and that is, look about 20 years into the future to see what the threats are going to be out there, who the enemies might be, what the technology might be and so forth and say, "how would we fight the close air support mission then," and then, over time, divest systems or buy systems, whatever, between now and then.

As I see close air support, say, 20 years hence, and I do a lot of writing about the year 2010, I think the close air support mission will be very considerably done by autonomous systems, at least initially—systems that are flying around, loitering around and so forth and coming in on targets based on very sophisticated technology, very accurate things, to take out key elements of the enemy air defense system, in other words, to get those key SAMs and those radar sites and so forth.

The fixed-wing aircraft will still play a role, but I would argue only after some of that very sophisticated air defense system is broken down to some degree and then the fixed-wing aircraft, the helicopters and others, being less vulnerable, will play an important role in getting ordnance on target and killing targets, so you are not going to throw the fixed-wing aircraft out of the picture; you are just going to play it tactically a little differently than we have done in the past.

Mr. Mavroules. Dr. Mark, I think you responded to that when you talked about the Israeli operation in Lebanon in taking out some of the SAM sites.

Dr. **Mark**. Yes, I would say that is the model General Smith just talked about. I would caution, though, and this is a lesson now from the Afghanistan operation—that you don't take out the hand-held anti-aircraft weapons that way. You don't take out the Stingers or the SA-7s; and therefore, the low-performance aircraft are still going to be relatively more vulnerable than those fellows who can come in fastest.

The Stinger has a hard time shooting down an airplane flying at Mach 8. It doesn't have a hard time shooting down a helicopter.

Mr. **Krings**. What Hans has said was the most difficult part in creating the test. Stealth has really come to the battlefield like gang-busters—happens to be a soldier out there with a Stinger. He doesn't have much signature; he doesn't make a lot of noise; he doesn't make a lot of smoke; you can't find him on a radar and you can't smell him or hear him so stealth has come to the battlefield when a single man can successfully deal with a very, very sophisticated product.

As things go on and the Stinger becomes—or Stinger-like devices become more successful with more sophisticated aircraft, the threat to aircraft will continue to go up. The shift to the dominance has gone to the ground. That is a fact of life.

So when we planned the test, we accounted for the proliferation of hand-held surface-to-air missiles in the threat that will face the CAS aircraft.

Mr. **Mavroules**. OK.

Let me throw a couple of other things out here. Now we have the Army out there in a war mission; you have confrontation; so let me just throw this out for discussion.

Why does the Army need the Air Force for close air support and why can we not develop the proper weaponry systems that the Army can take care of themselves?

General **Smith**. If I can lead off again, I think the Army could do that and I think the Army, if given that mission, would do it well. It would take them some time to develop the systems and develop the command and control business and all that, but they would do it well; they would probably model it to some considerable degree after the Marine Corps, which has done it quite well; but the problem with that, as I have pointed out, is if they run out of resources and all of a sudden need help from somebody, they want to have somebody who rolls in with them that has been trained with them, worked with them, worked with the system and so forth; and if the Air Force is completely isolated from the mission, they won't be able to do it very well, at least for a few weeks or a few months in the crucial part of the war.

So, keeping the Air Force in the close air support business keeps the Army and the Air Force close together and I think——

Mr. **Mavroules**. In other words, you are saying dual operation, perhaps, General, Army and Air Force?

General **Smith**. Clearly, the Army and the Air Force together need to do this mission; but to get the Air Force completely out of it, I think in the long term, would be a mistake.

I would like to add one other point to relate to Jack's point. I flew a lot in Southeast Asia and got shot at a lot and I flew it in an F-4 airplane, which is a fairly fast airplane. The one thing we used to say over there was keep your energy up; keep your air speed up. We could actually outmaneuver lots of stuff coming out at us. You could see it coming and you could bend the airplane, pull a lot of Gs and drag those guns behind you. If you don't have the energy and you are getting shot at a lot by a lot of different systems, you are going to lose a lot of airplanes. So energy is an important factor.

Dr. MARK. Speed is important, same thing.

General SMITH. Speed and energy. We used to call it energy at the—it is speed and G——

Dr. MARK. Altitude.

Mr. KRINGS. A suggestion that the Army might develop a replacement, really, I guess, you are suggesting for the Air Force's role. I guess I would argue that that is what the Army has probably been doing for the last 10 or 15 years.

Since they are the killers of threat CAS aircraft, they recognize the survivability of CAS because their air defense people live as a result of how successful they are in killing threat CAS aircraft. So there is nobody in the world who is more aware of the survivability of a close air support airplane than the Army is because they get programs as a result of how well they kill enemy aircraft in testing, so they do it quite well.

I think that as a result of their capability to kill enemy aircraft, they have recognized that the fraction of contribution of the fixed-wing close air support airplane, because of their increasing susceptibility to engagement has gone down.

So I think that rather than buy fixed-wing airplanes, the Army has decided to enhance the other tools such as Apaches and MLRSs that they have on the ground to accomplish what CAS might have accomplished if it were available in larger numbers.

So I think that they really have done a lot of this in the past.

Mr. MAVROULES. OK.

I have one final question, Mr. Chairman, if you will bear with me, and that is with reference to electronics and, of course, I am very high on that myself; but given a wartime scenario and given some of the problems that we are having with some of the systems that we have been testing—and Jack, you ought to be aware of that—how do we know this is going to work during a wartime scenario rather than a peacetime scenario?

Dr. MARK. Mr. Chairman, it worked in Afghanistan; it worked with the Exocets in the Falkland Islands war. I think that there are enough conflicts around so that you can go to other examples without having to rely necessarily on what has to be in the end a contrived test. I think these things do work. They have to be designed right. The engineering has to be done right, but they do work.

I would like to make one comment on your last question with respect to roles and missions. In addition to the point that General Smith made with respect to keeping the Army and the Air Force together, I think there is another thing that needs to be considered.

If you were today—and this is drawn now from my 4 years over in the Pentagon, from sitting with the military and the civilian people there—if you today were to go to the Army and say, "you've got the close air support mission," their first reaction would be, "Oh, my God, where are we going to find the money to pay for it?"

The fact is that, if you were to make a one-way decision of that kind, nothing would happen. The Army would turn it down. Guarantee you.

If you really are serious about looking at roles and missions, then you need to look at other places where there are interservice problems and see if you can make some trades so that the question of overall resources doesn't come up.

You see, if you only give the Army a mission, then they are going to ask, "Are you going to increase our budget and how do you know we can get it through the Congress and all that?" If you give them a mission and taken another one away and look at it in a broader context, then I think something could be done. I think it would not be a bad idea to look at the whole Defense Department and say, "Are there places where the Army is doing something that the Air Force ought to be doing and the Air Force is doing something that the Army ought to be doing," and see if you can make some trades that subtract the resource question from the argument.

I think that is the suggestion I would make, in the case of the Army and the Air Force, if you were to give the close air support mission to the Army, then you might go to the Air Force and say, "How would you guys like to take over the ABM mission that the Army is doing now?" I know that isn't very high priority with the Army and such a trade might be something that people would accept.

I am not suggesting we do it because I think General Smith's argument is a good one; but what I am saying is that if you seriously want to address that question, then you must do it that way because otherwise you are going to get resistance that will stop all thinking on the subject.

Mr. KRINGS. I might mention two things, the sensors. I think that we have proven pretty well the functional capability of the sensors on the autonomous weapons to operate there. Clearly, we still need to look at the battlefield significance because of the various techniques that the adversaries use to try to cripple those sensors and attack those sensors in a more robust environment.

We had a recent experience which a number of you people were aware of when we did forward area air defense tests of the so-called Line-of-Sight-Forward-Heavy, the Sergeant York replacement. We had a lot of candidates down there that actually had battle experience, but when put in an environment that was replicating where we intend to go, those weapon systems were not quite as successful.

So it depends clearly on how benign or how sophisticated the environment is going to be for these sensors to work. I think they show tremendous promise, but the potential for denying the sensors' ability to operate in a battlefield is still not totally understood.

I might say in the Army/Air Force CAS issue, I think it is a social issue that doesn't really need to be meddled with. The Army is not unhappy with the Air Force doing CAS. The role of CAS has shrunk during the last years. The Army has replaced some of that shrinking and I think that, as the General says, it is very important that the Army has a backup that it may not own itself. I think the relationship is not too unreasonable as it exists right now and I think that the old social pressures of Army fixed-wing aviation, et cetera, are kind of diminished.

There is a natural place for these activities. Since the role of CAS has gotten smaller, the necessity for the very quick response that you need when you have organic control may be getting a little bit smaller, too. That is what we hope to see in some of these early tests, whether the Army needs that sort of a thing and that sort of control.

I don't think that today's CAS and tomorrow's CAS will be better or worse if you change the roles. I really don't think so.

Mr. MAVROULES. Thank you, Mr. Chairman.

Mr. RAY. Thank you, Mr. Mavroules.

Mr. Hopkins.

Mr. HOPKINS. Thank you, Mr. Chairman. I have a question for Dr. Mark and General Smith, a little bit about the future. Before I ask them that, Mr. Krings, looking at your test plan, I am concerned that we might be biasing the analysis of systems by narrowing the Phase I review to just three aircraft. You specifically mentioned A-16, A-7, AV-8B.

Why don't we include all candidate systems for the close air support job?

Mr. KRINGS. Mainly because we felt that the primary intent of the first test was to see how much you should spend on the second test. Should we really make a sizable investment, which it will take, to get a real live CAS airplane out of an F-16, an A-10, a re-engined A-10, is expensive. An A-16 is expensive and it takes investment and development time.

We would feel that if you currently put—and we are not suggesting you don't do it; again, it is just a matter of time and dollars. You can add B-1s to it if you want to; it is so many dollars a week, but the concept right now was to find, is the up-engined A-10—is the A-16 concept really a viable one and should we spend the money to modify them for a competitive fly-off.

If the night attack AV-8B is a competitor we don't need to spend a lot of money to develop that. The same thing of the night-attack F-18 upgrade. That is another player.

I guess our argument is, we were looking at the smallest, quickest test we could do to get some insight to CAS itself and also to see whether or not we should spend a lot of money for a significant modification over the next 3 or 4 years or whatever it might take and then making a decision.

So there was no elimination of any of the candidates to reduce the information available.

Mr. HOPKINS. So you haven't made, really, any assumptions by limiting it only to——

Mr. KRINGS. That is correct.

Mr. HOPKINS. This is just Phase I, a preliminary thing. You are making no assumptions.

Mr. KRINGS. That is correct.

Mr. HOPKINS. Let me ask Dr. Mark and Dr. Krings something about the future. Both of you have talked about advanced technology and, General Smith, you mentioned looking at 20 years into the future.

I spend a lot of my time in the special-access world, I mean, a lot of my time. The other day, I was with some think-tank people and they were talking about information explosions that we are in currently, and hurriedly to bring you forward, they were talking about when we first started this experience in this world that we all enjoy, it took us a 100 years to double our information one time. Then we doubled it again in 50 years and coming forward rather rapidly. We are currently doubling our information every 3 to 5 years.

They went on to say that we will start doubling our information every year in the 1990s, which brings me to your 20-year projection. How are we ever going to maintain a state of the art when we are doubling our information this fast and some of the programs that you are talking about, I know what you are talking about, but I also see our new Secretary of Defense with his knife out whittling away at a lot of these programs. With that and the future in mind, and with the doubling of information, how do we ever get to the state of the art for any sustained period of time that we can afford?

Mr. KRINGS. The acquisition process in the Pentagon takes care of that.

Dr. MARK. Mr. Hopkins, let me try to answer your question.

When you talk about state of the art, you mean—you have to look at which of the various technologies that go into the weapon system you are talking about. The rate of progress, for example, in aeronautical technology, for reasons that I can go into which are reasonably well understood, is very much slower than the rate of advances in electronics technology for other reasons, technical reasons that I could go into.

We, therefore, have the phenomenon where you have 40-year-old airframes that are perfectly good airplanes with up-to-date electronic equipment in them. That is, we don't have to upgrade the whole thing. The A–16 proposal is a typical example. The Air Force is not proposing to change the airframe. The airframe is a perfectly good airframe and my guess is that the F–16 is going to be a good airframe for another 15 or 20 years.

You are going to put several different generations of new electronic systems on that thing before you get finished with it, just the way we have with the B–52.

The point about maintaining the state of the art, then, is to design your systems in such a way that you take into account, from the very beginning, which technologies are going to have a rapid rate of development and which will have a relatively slow rate of development. You make the commitment to those things that are slowly moving and then you design those things in such a way that you can change those things inside that move rapidly.

We modify airplanes—General Smith is more knowledgeable than I am on this, but the A–7 has gone through, how many mods? When we learned more about plastics, we put good fuel tanks on them so that we don't lose the airplane when the fuel tank gets hit. It is really not only electronics. Another example is the anti-glare canopies that we put on existing airframe.

I don't think the problem that you outlined, from a technical point of view, is as difficult as one might think. One can, in fact, keep up if one builds into the system in the beginning the idea that you are going to have to do that.

General SMITH. In fact, I would argue it is a great advantage to the United States because we are an entrepreneurial people; we are a creative people; we are innovative people and we accept changes in technology better than some other cultures, including the Soviets.

I agree with Dr. Mark. You get an airplane like the F-16, which I flew for a number of years. It is a considerably better airplane today than when I flew it in the early 1980s because we have been able to pull out and plug in new black boxes and new radar packages and new software and new head-up displays and all those kinds of things without doing major changes to the basic airframe.

I think, as we look forward to the next 20 years, we have to ensure that those new systems, whether they be autonomous vehicles or whatever, are designed in such a way that they can accept these kinds of changes rather easily with a plug-in/plug-out kind of system so that they can evolve quickly and still be usable for a considerable number of years.

That would be one of the questions—if I was still in the special-access programs, those would be the kinds of questions that I would ask, how easy is it to take system A and update it to a better model and how much is it going to cost and are you going to plan that in the initial design of that system?

Mr. HOPKINS. Thank you very much.

Mr. RAY. Mr. Kyl.

Mr. KYL. Thank you, Mr. Chairman. I remarked humorously to Mr. Hopkins' question that the one thing that would constrain us is a 5-year test program, and I think the response was almost on target there, the acquisition, the program.

Mr. Hansen and I were musing during the discussion of the test, Dr. Krings, that an 18-month Phase I and 42-month Phase II is longer than World War II.

Mr. KRINGS. Significantly longer than the creation of the earth.

Mr. KYL. Depending upon which theory you believe.

I am struck by that and I am sure that, given enough time and enough money, we would probably be involved in a continuous testing program and, to some extent, of course, we are in virtually everything we do. But that seems like an awfully long time.

The other question I have has to do with the role of the helicopter in all of this. It has been alluded to a couple of times, and it is unclear to me exactly how the three of you view the helicopter as participating in this close support program.

It is manifest that the slower machines are losing out on the battlefield, and therefore the emphasis on the faster weapon; yet, our strategy seems to presume that the helicopters will play a very, very vital role in the future. I would like to have any of you or all of you discuss for us just a little bit how the helicopter does fit in.

I gather there is some kind of a window after the immediate threat has been abolished, whether it be a SAM or whatever it is, that there are then opportunities for our aircraft to go in and do the job and you described how the fixed-wing aircraft would do that.

I gather that there is a role, then, for the helicopters to operate in that mode as well; but could someone clarify all of that for me, please?

Mr. KRINGS. In the test plan that we submitted, there will be helicopters operated by the Army as they would normally operate, so that the Army will be operating ground forces, just as they do today, and intend to.

In that scenario, the helicopter is one of the tools that the Army uses, but it is not classified as CAS, as we are discussing it here today. CAS, as we are discussing it here today is the Air Force contribution by fixed-wing airplanes.

One might look at data after the test and see whether or not they were competitive activities, but as they operate right now, helicopters are supportive activities by the Army and they will be definitely part of the test, as will any other Army asset that they normally use.

Mr. KYL. I understand that as a formalized structural way to analyze the problem, but now imagine a real battle and you have certain assets. Right now, we have a bunch of assets to apply to that battle.

The first thing we have to do is knock out the biggest threat. We may do it the way the Israelis did it in the Bekaa Valley; we may do it some other way. Then we send in some other weapons to do the job.

Now, I gather today that would be whatever fixed-wing assets we have and helicopters, like the Apache, doing kind of the same thing. So what is the role, then, of a fly-off, if half of the equation which may be capable of doing the job is not really in the competition? Or are you saying, first, we are going to figure out which of the fixed-wing does the job and then somehow fold the helicopters in?

Mr. KRINGS. I think you have hit on the fundamental question. If you look at this test, we are going to try to execute it just as the Army operates today.

The ground Army commander has a number of tools to deal with whatever the situation is. If he is advancing; if he is holding position; the various events that the Army does, he has a bag of tools, if you will, of which Apache is one of them, MLRS is one of them, artillery is one and Air Force fixed-wing close air support is one of them.

I think that they are not competing with each other necessarily. The Army commander is using the ones that he thinks are best for the particular event that he is doing at the time. It may be that he would never even call on CAS; it could be conceivable that he would never use the Army helicopter for that particular event or any one of the other tools, but he has all these at his disposal and so what we are trying to say is, whatever the use of that tool of the close air support is, we are trying to find out what is the best candidate to provide that particular fraction of his firepower whenever he needs it and how he needs it.

Mr. KYL. A couple more thoughts.

It almost does presuppose that there are needs for both types of weapons, both the fixed-wing and the helicopter. Right?

Mr. KRINGS. That is the going-in supposition, yes.

Mr. KYL. OK.

Second, then, will there be some kind of analysis that seems to me to be necessary to determine how long in the future the Apache, as it may be upgraded, will do its job or whether we really have to bring in more of a quick stealthy light helicopter to ultimately take the place of the Apache or to supplement its job and so on?

In other words, aren't all of those considerations in this test that is going to be performed?

Mr. KRINGS. No, I think that is what you have to do and others have to do. This test is only to do what we were asked to do and clearly, it would be far beyond our scope in this test to try to determine how long an Apache is going to last. But if the Apache comes up to be a very significant contributor as a result of these tests, we would certainly suggest an assessment as to whether we are buying enough.

So the analytical process that is done after the test would certainly look at the things that you are suggesting but hopefully with a little bit more creditable data from this test.

Dr. MARK. Mr. Kyl, may I——

Mr. KYL. Excuse me. Let me ask one more question that may help to frame what I am trying to get at and then please respond.

I am sure that I am wrong on this, but I will just tell you what it seems to me. There is an idea or an assumption that we have always had fixed-wing close air support aircraft and, therefore, we must have one for the future; and ever since we invented the helicopter, we have always had helicopters that did that job, too, so we are going to have a helicopter to do that.

Once again, we are buying a piece of equipment for people to use and trying to figure out which is the best one, but haven't really looked at it from a mission requirements' point of view. We are constantly suggesting that we should approach it from the question of what is needed; what mission needs to be performed and then what one or many weapons can best achieve the successful mission.

Tell me why I am wrong in sensing that is kind of what this is all about. I realize I wasn't on the committee when the committee asked you to perform the task.

Mr. KRINGS. You are not wrong and that is being done. At this time, because of some of the suggestions that you have made here and what we are doing in the Department of Defense right now, we are going back through the JCS process to look at the basic generic mission need statement for fire support for the Army.

The answer may come out death rays from space or poison pilots. I don't know what the answer is, but it is a generic look at how do we deal with fire support. There is no preconceived answer. That is the way we are trying to discipline ourselves to do business these days and you come out at milestone zero with a joint, agreed-upon mission statement with no answers, just the questions.

Mr. KYL. So you could theoretically conclude, after the exercise that, as it turns out, the only thing that really works very well—I am just hypothesizing here—the only thing that really works is the

A-16, and we are going to scrub all of our Apaches and any other fixed-wing aircraft; or, just as theoretically, you could conclude the only thing that really works here is an Apache helicopter. These jets just don't cut it.

Or you could conclude that there are very specific and important critical missions for both that only one can perform that part of, so that you really have two specific missions here and the helicopter does one and the fixed-wing does another. Are all of those theoretically possible here?

Mr. KRINGS. Not within the scope of this test that we are doing. I don't want to convey the image that that is the purpose of the test. I am saying that parallel to the test, we have required that the Joint Chiefs of Staff go back and look at a generic missions statement for this that is a much longer-reaching event than just a 1-year answer as to how we do CAS and what are the potential aircraft.

I think that what you are suggesting is absolutely being done, but it is clearly not a part of this fairly narrow operational test.

Mr. KYL. So basically the assumption here is we are going to have a need for fixed-wing aircraft and which one is the best one to perform the job?

Mr. KRINGS. In this test, that is true. The question was, what is the best candidate aircraft to perform the CAS mission and that is what we are trying to see.

In the meantime, you can't help but see what is the CAS mission because you can't make a determination of the object until you better quantify that which the object must do.

Mr. KYL. I really have something different in mind and that is the Apache and the LHX and all of that. I think that really needs to be done in that particular situation. I don't mean to cut anything off. That was kind of my line of inquiry. If either of you have any comment, I would appreciate hearing it.

Dr. MARK. I would like to make two points about helicopters. One has to do with the experience in Southeast Asia, which is a place where helicopters were used in profusion. If you ask, based on the history of the war in Vietnam, where helicopters were decisive; that is, where did they have a decisive influence on the course of events, it was not as gunships. It was as transports, as evacuation vehicles. In other words, in other supporting functions.

In fact, in looking at this, I read somewhere that the recovery rate of wounded in Southeast Asia was significantly higher than in all previous conflicts because of our ability to evacuate people and bring them to base hospitals much, much more rapidly than we have ever done before. That was because we literally had thousands of Hueys there doing that.

So the helicopter is an extremely important addition to the battlefield for a number of reasons. To me, those reasons transport and evacuation—are the most important.

Now, what is the property of the helicopter that allows you to do that? The property is that it can land anywhere and take off from anywhere. That is the central feature; and if you are going to look at uses of the helicopter, it should be built around the ability of the machine to get down, do something and then get away again.

As a platform to mount a gun to shoot at somebody else, it has the limitation that it doesn't fly fast. One trouble with a helicopter is you can't push it through the air very well.

So I would submit that the helicopter is an extremely important weapon, but its decisive uses are in areas other than the support of troops on the ground, by putting ordnance on the ground, because in order to do that, it has to expose itself and then it becomes vulnerable.

The Russians found that out in spades in the last 2 years in Afghanistan.

Mr. KYL. Thank you, Mr. Chairman.

Mr. RAY. Thank you, Mr. Kyl.

Mr. Krings, I think you had mentioned some figures, cost figures of $45 million in 1990, $5 million in 1991——

Mr. KRINGS. Yes, sir.

Mr. RAY. Then $75 million thereafter up through 1995. Is that——

Mr. KRINGS. I think it was a $75 million total, 1992 through 1995, to accomplish the second phase of tests, which, I might add, is contingent upon the outcome of the first phase of testing.

Mr. RAY. The first phase is $45 million——

Mr. KRINGS. That is correct.

Mr. RAY. Then $75 million for the second phase?

Mr. KRINGS. That is correct.

Mr. RAY. I see.

Mr. KRINGS. That does not include the modification of the aircraft.

Mr. RAY. I see.

Mr. KRINGS. That is to perform the test.

Mr. RAY. I see. Would you have any idea about the modification at this point?

Mr. KRINGS. Yes. I think we put a number in our report which was given to us by the Air Force that was the 3½ years and $250 million or—it is in our report, and that is a ballpark number.

Mr. RAY. Right.

We have had a lot of testimony through the years about the effectiveness of the F-16. I recall from time to time the Air Force and, as a matter of fact, on occasion, it has been said that the F-16 already is such a precise aircraft that it can use World War II iron bombs and put them right on target right now.

So I just wondered, is that true and what sort of a modification would we have to do if it is already such a perfect airplane?

Dr. MARK. If you have good intelligence—the key to the Israeli operation was that with some drones, they pinpointed the targets; and, if you really can vector the airplane in and then keep track of where it is and do your release calculation properly, you can do that. The pilot really just barely sees this thing flash by; but if the system is set up to do that, you can work that problem.

I think I gave you the example of the Argentines and the A-4s. It is the same problem. They had to know where those ships were in Falkland Sound in order to come in over the hill so that they wouldn't be exposed to anti-aircraft fire and then get right down on that ship. The way the Argentines did that, they had an airplane orbiting above at high altitude that told them.

So I think that can be done if you set up the command structure properly.

Mr. RAY. So we would plan to modify the F–16s where we would not need that—like the use of the Drone or——

Mr. KRINGS. The proposed modifications for the F–16 are primarily to facilitate the transfer of information with respect to target location from the Army observer in the field closest to the target, to the aircraft itself. If one were to use a drone or other known information as to where the target is, then you still have to communicate to the pilot basically when he is in the area of close air support. If he knows where he going before he goes and the threat is pretty far back beyond the front line of troops often that is into the category of battlefield interdiction.

If he is going to go to the target and find what the target is when he becomes close to the target, then that is more classically called close air support. You have to have the communications link that will tell the pilot precisely where the target is. The capability to send this information in data bursts is one of the improvements needed for conducting CAS.

Another is for improvement of night vision. There are many ways to do it. IR primarily to make sure you are hitting the right target and so, consequently, that is an improvement in the F–16.

There are other things that allow it to carry more equipment, more weapons and to be more easily adapted to typical air-to-ground weapons, rather than having a large multi-role capability. It would still retain the multi-role capability.

The improvements are probably necessary if it is going to take on a major air-to-ground capability.

Dr. MARK. I might add, Mr. Chairman, that one of the things I remember testifying on before this committee 10 years ago that now will have a decisive effect on our ability to do this with F–16s is a satellite system called the Global Positioning Network. That network will allow us to position people on the ground and get reference points for these targets that you, with this communication system, were talking about, that would allow you to do this pinpointing of what you are trying to shoot at.

Mr. RAY. You do suggest that we should improve the engines in the A–10 should we decide to proceed with the A–10 as close air support.

Mr. KRINGS. I think that is the premise of the first test, to try to get a surrogate that is an upgraded A–10 equivalent and determine whether or not that investment is a reasonable thing to pursue.

Mr. RAY. I see.

Mr. Scrivner, do you have any questions?

Mr. SCRIVNER. I would like to just talk a little bit about the test plan, if we could, Mr. Krings, for a minute.

So that we have assurances that we have a level playing field, can you tell us how much of the test plan is actually predicated on the service desires or has been influenced by the respective services' known position on CAS?

Mr. KRINGS. The service desires and their known positions were totally their responsibility, but it was the service desires and their positions at the recipient level, not necessarily at the executive level. We went out and talked with the people who are going to do

CAS and who are going to receive CAS and all the scenarios and all the planning is based on the real participants who need the product at the bottom and were clearly not influenced by those at the top that could conceivably have different ideas.

Mr. SCRIVNER. So we shouldn't have any concerns that Phase I is limited to three aircraft, and we shouldn't have the impression that the test is biased in any way so the competitive fly-off really reflects the Air Force approach to the CAS mission?

Mr. KRINGS. No. I really don't think so, Pete, and I would say that the fact that we have tried to recommend or identify that it can be modular-added—if anyone is concerned, whether it be a service or whether it be you or anybody else who is concerned about the absence of any player in the first test, it is *x* number of weeks and *x* number of dollars, and it can certainly be accommodated to a level playing field.

What we were trying to do was to reduce the total overall cost by only putting in those that had the probability of modification where the big dollars are.

But the same tests would apply to any weapon system that was involved.

Mr. SCRIVNER. Can you tell us, then, what the additional costs would be for the test to include the Harrier?

Mr. KRINGS. Yes. I think in our report—and I could find those numbers, it is——

Mr. SCRIVNER. What the additional costs would be with respect to—as a follow-on to Mr. Kyl's questions about including helicopters in the test plan?

Mr. KRINGS. I have just been told it is about $4 million a participant, roughly, as many as you want. I don't know whether there is a better price if you bring three or four, but it is $4.5 million basically, and the helicopter contribution to this activity, even as it is currently structured, will be analyzed and evaluated, but it will be playing its typical role as helicopter support to the Army commander, not a different role than it is currently assigned.

If you would suggest that the helicopter act in the equivalent role of the CAS Air Force, I don't see where that is any big problem to do that, but that if not currently planned in this test. Since the helicopter will already be present however, it might be possible to measure what its contribution is.

Mr. SCRIVNER. One final question, is the testing going to be designed so that we assess both hard and soft kills?

Mr. KRINGS. This is a difficult part and I think if you read through the limitations, you will find that this is the most agonizing part of it.

It is so much easier to count evaporated tanks after a test, rather than try to figure out what the soft kill or operational kill is. We have a mechanism, an analytic mechanism, whereby we tend to not just determine those tanks that are so-called "killed," or that are obliterated, but those that are rendered ineffective and there is another element that is incredibly difficult to measure, which is very, very vital, though, and that is what is the presence of CAS, just the presence of it; the suppression that CAS contributes to the Army commander is a very, very big thing and it is the most elusive, but it is not that we haven't recognized that; it is just that it is going to be difficult to measure, but we certainly intend to look.

Mr. SCRIVNER. Are we also going to measure both hard and soft kills of CAS aircraft in the testing?

Mr. KRINGS. I have to ask somebody.

Yes, we have a mechanism, not unlike that which we have used for forward area air defense to measure—in that case, we were shooting red air—what the hard kill, the PK values are, a range of other than just one. Yes, so soft kills—and again, causing him to not do what he came to do is clearly a very significant event, too.

But as you know, as we have found in many other tests the softer the kill is, the more difficult it is to measure.

Mr. SCRIVNER. I understand.

Mr. KRINGS. But we clearly intend to look at the CAS attrition, both in ones and zeros and less than that, yes.

Mr. SCRIVNER. Thank you.

Mr. RAY. Mr. Dranttel.

Mr. DRANTTEL. Thank you, sir.

Mr. Krings, you mentioned that the JCS was doing a study of the mission area of close support as opposed to close air support. The interim reply that we have from DOD about that study indicates that what the JCS looked at was close air support and the requirement for a close air support replacement aircraft.

Are you aware of—is that a disconnect or are you——

Mr. KRINGS. No. No. I am aware of that and that is a good thing to do, but the overall generic fire support requirement is also going to be pursued.

We need to look at all potentials, not just which fixed-wing can do that particular fraction. So it is essentially two efforts. The effort that you are familiar with is the response to what you have properly described.

Mr. DRANTTEL. OK. Are you aware of any other studies that are looking at that broader issue that we could have some insight to as we pursue this issue?

Mr. KRINGS. No, I am not familiar. I don't doubt that there are others, but as far as a sort of a disciplined official request within the way we do business in the Defense Department, this is going to be a process to look at generic close support for the Army.

Mr. DRANTTEL. OK.

Mr. RAY. Mr. Necessary.

Mr. NECESSARY. Thank you, Mr. Chairman.

I have two questions, or maybe just observations.

First, when the discussions were going back and forth and we were starting to get into the quality of support that one platform or scheme of close support might provide over another, I got the sense that it was being thought of or measured in terms of survivability of the provider of the support. I didn't hear much about quality in terms of what it would do for the supported. In fact, in studies and discussions outside this hearing and elsewhere, I hear very little about that.

My sense is, if it is not doing something for the guy on the ground, what is the point?

Mr. KRINGS. The measurement in the test clearly is not weighted in that direction. The measurement in the test part is clearly in the direction of effectiveness and survivability, but not just survivability.

Mr. NECESSARY. Effectiveness as viewed by?

Mr. KRINGS. By the guy who called the CAS in.

Mr. NECESSARY. So he is going to be the one who is going to determine the attributes that measure the effectiveness of the support provided?

Mr. KRINGS. That is right, because, as he would in real life, he will essentially say, "Did you get the job done or didn't you get the job done," that he wanted to do, and that is the measure of effectiveness, not in the deliverer, but in the receiver.

Mr. NECESSARY. OK. So the test will be able to discriminate in that sense?

Mr. KRINGS. Yes.

Mr. NECESSARY. OK.

Mr. KRINGS. Sure.

Mr. NECESSARY. The second thing—we probably have a test design that is going to do what was directed in statute and that may or may not be consistent, either totally or in part, with kind of what people think they want. I think the fundamental question that we are trying to get at at some point is that there are a number of tools that provide support to the ground forces.

I think in the budget environment we are in, we are looking for ways to evaluate the return on various close support investments that might be made. In your judgment, will the test at completion provide some means for doing that, at least in part?

Mr. KRINGS. Yes, but I would focus on the end of your question because it certainly is not going to answer the larger questions as crisply as some people might want, but it will give us an insight. It will certainly give us some insight as to where we might look, but I wouldn't want to characterize the test as giving you an answer as to whether there are other weapons that are better to invest in because the return to the ground commander is greater, but certainly I think it will begin to show that.

A test of that type, I think would be much larger, but that is not saying that you can't draw significant inference from what we are doing. So I would say, yes, it is a step in that direction, but clearly not the final answer.

Mr. NECESSARY. Noting that we have one way of performing these kinds of functions in the Marine Corps, a different one, with the Army/Air Force team, maybe what we have is two there, the rotary wing, the surface-to-surface assets vis-a-vis the addition of fixed-wing close air support as we have known it.

What is the basis for the investments that we have made in these assets to date? Is there some objective way to calculate return on an investment or do we just keep doing what we have always been doing?

Mr. KRINGS. As you know, most of them are extensions of the past. They don't always stand back and take a new look at opportunities. As Hans Mark was saying, there are lots of different ways in the future to do this and I think all of us have suggested that we need some sort of a longer look, sometimes, rather than just an improvement on what we do. Things are going to be different in the future.

I would suggest to you that, if this is really fundamentally what you are looking for, it is not unreasonable to look and see how much credibility could be added to the argument by additional ground testing or operational testing.

I think there are many arguments; there are many solutions; the question is which ones are the most creditable answers. I wouldn't want to suggest that we have to expend an awful lot of dollars in big operational tests to get those answers, but this may add some credibility to our decisionmaking.

Mr. NECESSARY. OK. Thank you.

Mr. RAY. Mr. Barrett.

Mr. BARRETT. Thank you very much, Mr. Chairman.

All three of you indicated continued support for close air support. I am wondering, were your remarks directed at the definition, the JCS definition that General Smith provided. As I understand that definition, it refers to troops very close—if noncontact—very close to being in contact; a condition in which you have to have precise delivery of weapons because, otherwise, you are liable to kill friendly troops; and also a condition in which there is a need for very close coordination of aircraft control.

So I would like an answer from each of you; and specifically, Mr. Krings, does your test only deal with targets that are very, very close, in close proximity to troops in contact, or does the test have targets that go further back to targets that might support the battle, but not be actually engaged at that point?

Mr. KRINGS. We used as a definition which the Army ground commander would use in a real situation. What kind of targets would you call close air support in to kill, rather than establishing specific ranges. We went out to the troops, if you will, the people who call for CAS today and will call for CAS in the future, through an extensive—I mean, not just one place, a lot of places—and said, "What kind of targets and how far away would you be calling CAS?" That is the definition that we used.

That is the basis of the scenario in our test. It is not necessarily what somebody thinks we are going to do, but what, in fact, those people who are actually the requesters of support would do and how the Air Force would respond to them.

So I would say there are—I don't remember some maximum ranges--as far as 10 to 12 kilometers deep, so we didn't bias the test.

That was the ground commanders' views as what they expect from CAS.

General SMITH. Let me answer your question, Mr. Barrett, in a general sense.

A lot of people think of close air support as just one kind of basic mission, but really, if you look at it carefully through history, there are at least three or four separate types of close air support. For instance, at times of a great breakthrough, you put a lot of concentrated effort so you can break through or you are trying to protect the flank, where you have troops in contact, but they are fairly thinly spread out and you are trying to keep the enemy from coming in on the side when you are racing across France, as George Patton did in 1944; or in a situation where it is a fairly static battlefield and you are just dealing with the day-to-day problems that somebody needs some help here because there is a small engagement and so forth.

So it seems to me that, if you are going to look at close air support, you have to look at it in at least those three various elements; but in all three, it seems to me, they have to be close to the battlefield where there are friendly forces engaged or about ready to engage with the enemy; where there is a considerable danger that if you don't do it well, you knock out a lot of your own friendly troops and so forth, so that, it seems to me, is the unity behind close air support.

Mr. **Barrett**. Then the conclusion, it seems to me—at least one conclusion is that the definition of close air support that we have had over 40 years may not be what we are dealing with today, certainly not with what Mr. Krings is dealing with, up to 12 kilometers behind the line. If you have a target 12 kilometers behind where troops are in contact, then you don't need particularly so much air traffic control; you are not worried about fratricide with your own troops; your axis of attack can be from several different directions. You can use a fast mover, as Dr. Mark talked about, rather than perhaps having to slow down so that the pilot can see the target and be sure he is going to hit the enemy, rather than friendly troops.

The result is that you have a different type of requirement for a different type of aircraft and different type of armament than if you are just concentrating on troops in contact.

Mr. **Krings**. I agree with you, and I think that to focus so narrowly on people across the road from each other—the numbers of occasions may not warrant that. That is why we suggested going out to the people who need the CAS and let them tell us what CAS really is.

Mr. **Barrett**. I agree with your approach, but the implications——

Mr. **Krings**. It screws up everybody's idea of what CAS should be when you go and ask the customer what it really is.

Mr. **Barrett**. We may need to get into defining this mission a little bit better because, of course, the Air Force comes over and justifies weapons systems on the basis of a fairly narrow definition of close air support. It may lead to different types of aircraft for different purposes, is my point.

Would you like to comment on that?

General **Smith**. I guess my only follow-up comment to that is you are really into the area of the line between battlefield air interdiction and close air support, and where is that line and what is the situation; the best people who could bring you information on that would seem to be the Europeans, who debate this issue constantly. Where is BAI and where is close air support?

You might either go on the road in Europe or bring some people in and get people who have dealt with that in real terms in the day-to-day activities; and maybe we could polish up the definition of close air support based on lessons in recent wars and debates in other countries and so forth.

Mr. **Barrett**. Thank you, Mr. Chairman.

Mr. **Ray**. Ms. Slatkin.

Ms. **Slatkin**. Thank you, Mr. Chairman.

If I may, just a couple final questions for you, Mr. Krings, if you don't mind, on the issue of the JCS study on fire support. It took us a little bit by surprise.

Could you tell us in general terms what the Joint Staff is doing as it looks at the definition of fire support?

Mr. KRINGS. I don't want to convey the image that this has been going on for a long time. What I am trying to tell you is that this is what we are trying to do. This is what we are going to do. We intend to look at generic fire support by the JCS, JROC, MNS mechanism that looks at this because it is painfully obvious that that is a need. There are many different tools at the grasp of the Army commander and we need to see more accurately what should be the tools that he needs in the future.

This effort is somewhat as a result of the relatively narrow effort that JCS has recently done. That is an approach to a question, but not necessarily the approach to the more generic question.

So that is being done, but I don't want to convey the image that this has been going on for a long time.

Ms. SLATKIN. Sure.

Let me follow up, then. How does your test feed into this study of fire support and the definition? Does it feed it at all? How does it? Should it?

Mr. KRINGS. It could, but currently it doesn't. The test was perfected before this particular effort was undertaken and it would certainly be an element in that, but as it stands, in response to your request, it is not an integral part of that study.

Ms. SLATKIN. Should it be sequenced in a different way, in that, for example, the Joint Staff's study of fire support precede the operational test?

Mr. KRINGS. That is a question I hadn't thought about before. I think that perhaps the study could benefit from the results of the test, but I don't imagine the study—usually at that phase—to go into milestone zero; it is more a definition of the question, as opposed to milestone zero to one is generally the point at which you really validate the concept and then from milestone two to three, you look at the demonstration and validation techniques, so I don't know. I would certainly like to give that a little thought.

Ms. SLATKIN. If you would, please.

Thank you.

Mr. RAY. Mr. Scrivner.

Mr. SCRIVNER. As a follow-up to Ms. Slatkin, how would you—and if you want to answer this for the record, it would be fine—how would you change the test design to have a greater—a better fit, if you will, between the joint study that is ongoing and the test that we contemplate?

Do you want to take that for the record?

Mr. KRINGS. Yes.

[The following information was received for the record:]

An operational test can only provide data on specific testable issues. Many issues related to fire support are not directly testable and require a broader strategic context. Some examples are: the availability of artillery, the priority placed on counterfire, the apportionment of airplanes to CAS missions, the suspectibility of airplane and helicopter support facilities to enemy attack and the priority assigned by the enemy to attacking those facilities.

I believe that the first step in addressing the issue of providing the best possible fire support for our soldiers is to develop a generic statement of the problem. Dr. Chu and I have recommended this course of action to the Secretary of Defense. This mission need statement should be followed by a thorough analysis, through modeling and man-in-loop simulation, of individual system effectiveness and synergistic effects of multiple systems. It is here that operational tests can be of great value in providing data upon which to base the assumptions which drive these analyses.

If the debatable assumptions were known early enough, it might be possible to make some changes to the Phase I test to provide objective data to support these assumptions. Due to the current status in the development of a generic mission need statement, this is probably not feasible.

I do not recommend changing the Phase I Modification Decision Test described previously in my testimony. This test will provide realistic, unbiased data to support a decision on whether the F-16 or the A-10, or both, should be modified for the Phase II Competitive Fly-off Test. It will provide some insight into basic CAS issues such as speed, agility and altitude effects on killing assigned targets and surviving. In addition, it may provide some observations into the efficacy of fixed-wing aircraft performing CAS in a high intensity conflict.

This test is *not* designed to provide a comparative basis of measurement between different types of fire support (e.g. fixed-wing vs. helicopter vs. artillery). Helicopters and artillery are present only to provide a realistic tactical situation. The scenarios developed for this test encompass the full spectrum of situations when Army users at the operational level would call for fixed-wing close air support. Several of these situations would not be likely occasions for the employment of helicopter (i.e. routine usage for penetrations of 10-12 kilometers past the FLOT). Since the helicopter will be instrumented, however, it may be possible to gain some insight into their effectiveness as compared to fixed-wing aircraft for limited situations. The instrumentation and test techniques for measuring the effectiveness of artillery indirect fire is much less developed than are our abilities to measure direct fire.

An alternate solution would be to change the objective of the Phase II Competitive Fly-off Test to have it support any JCS or OSD comparative analyses and to conduct it much sooner than planned (maybe 12-18 months after the Phase I test). While this option is certainly possible, I caution you that in order to acquire meaningful data two events must occur: first, there must be a consensus on the specific objectives so that we are addressing the right question; second, a sophisticated, mobile instrumentation and threat capability must be developed. The Capabilities Improvement Program which I addressed earlier in my testimony could serve as a start to satisfy this requirement. I would need some time, following the development of a generic fire support mission need statement to assess what operational testing could address and resolve in this complex issue and to develop the cost of conducting such a test.

Mr. SCRIVNER. So we have a better fit. In other words, as Ms. Slatkin suggests, we are a little bit out of sync here. It may be that the test plan needs to be revised so that it fits more in line with this whole generic fire support study that the Joint Chiefs have under way.

I would like——

Mr. KRINGS. I have to interrupt you. You used two phrases, "ongoing" and "under way," that conveys a lot more maturity than has currently evidenced in that——

Mr. SCRIVNER. In the Joint Chiefs' study.

Mr. KRINGS. Right.

Mr. SCRIVNER. All right. Well, for the record, why don't you be very precise as to the exact status and still how one should modify the test plan.

Mr. KRINGS. Yes, we will be glad to do that.

Mr. SCRIVNER. Thank you.

[The following information was received for the record:]

A memorandum recommending preparation of a generic fire support mission need statement, jointly signed by the Assistant Secretary of Defense (Program Analysis and Evaluation) and me, was forwarded to the Secretary of Defense on 5 May 1989.

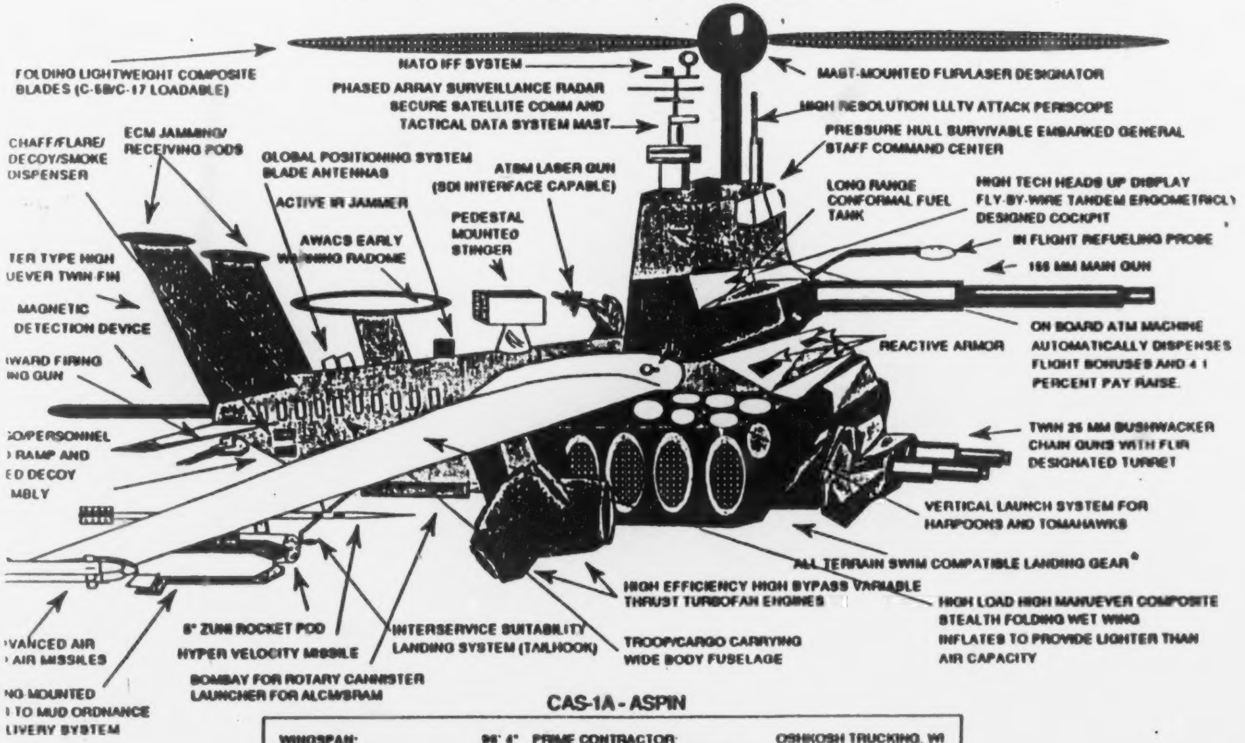
The memorandum noted that the work to date has been good but too narrowly focused on a fixed-wing aircraft solution. It recommended that the Joint Chiefs of Staff be tasked to give a generic problem statement for fire support independent of solution types like artillery, helicopters or fixed-wing aircraft. This approach will lead to a more balanced and objective resource allocation.

Mr. RAY. Dr. Mark, Major Smith, Mr. Krings, is there any other comment you might like to make?

If not, we will adjourn the meeting. The meeting is adjourned.

[Whereupon, at 3:15 p.m., the subcommittees were adjourned, to reconvene subject to the call of the Chair.]

CONGRESSIONALLY MANDATED CLOSE AIR SUPPORT AIRCRAFT DESIGN
CAS-1A "ASPIN"
(ADVANCED SPECIAL PURPOSE INTERDICTION NIGHTFIGHTER)


FOLDING LIGHTWEIGHT COMPOSITE BLADES (C-5B/C-17 LOADABLE)
NATO IFF SYSTEM
MAST-MOUNTED FLIR/LASER DESIGNATOR
PHASED ARRAY SURVEILLANCE RADAR
SECURE SATELLITE COMM AND TACTICAL DATA SYSTEM MAST
HIGH RESOLUTION LLLTV ATTACK PERISCOPE
PRESSURE HULL SURVIVABLE EMBARKED GENERAL STAFF COMMAND CENTER
CHAFF/FLARE/ DECOY/SMOKE DISPENSER
ECM JAMMING/ RECEIVING PODS
GLOBAL POSITIONING SYSTEM BLADE ANTENNAS
ATSM LASER GUN (SDI INTERFACE CAPABLE)
ACTIVE IR JAMMER
AWACS EARLY WARNING RADOME
PEDESTAL MOUNTED STINGER
LONG RANGE CONFORMAL FUEL TANK
HIGH TECH HEADS UP DISPLAY FLY-BY-WIRE TANDEM ERGOMETRICLY DESIGNED COCKPIT
IN FLIGHT REFUELING PROBE
155 MM MAIN GUN
TER TYPE HIGH UEVER TWIN FIN
MAGNETIC DETECTION DEVICE
WARD FIRING NG GUN
ON BOARD ATM MACHINE AUTOMATICALLY DISPENSES FLIGHT BONUSES AND 4.1 PERCENT PAY RAISE.
REACTIVE ARMOR
O/PERSONNEL RAMP AND ED DECOY MBLY
TWIN 25 MM BUSHWACKER CHAIN GUNS WITH FLIR DESIGNATED TURRET
VERTICAL LAUNCH SYSTEM FOR HARPOONS AND TOMAHAWKS
ALL TERRAIN SWIM COMPATIBLE LANDING GEAR*
HIGH EFFICIENCY HIGH BYPASS VARIABLE THRUST TURBOFAN ENGINES
HIGH LOAD HIGH MANUEVER COMPOSITE STEALTH FOLDING WET WING INFLATES TO PROVIDE LIGHTER THAN AIR CAPACITY
VANCED AIR AIR MISSILES
5" ZUNI ROCKET POD
HYPER VELOCITY MISSILE
INTERSERVICE SUITABILITY LANDING SYSTEM (TAILHOOK)
TROOP/CARGO CARRYING WIDE BODY FUSELAGE
NG MOUNTED TO MUD ORDNANCE LIVERY SYSTEM
BOMBAY FOR ROTARY CANNISTER LAUNCHER FOR ALCM/SRAM

CAS-1A - ASPIN

WINGSPAN:	96' 4"	PRIME CONTRACTOR:	OSHKOSH TRUCKING, WI
LENGTH:	74' 5"	NUMBER OF SUBCONTRACTORS:	434
TAKEOFF WEIGHT:	133,000 LBS	ESTIMATED COST PER UNIT:	$1 MILLION
MAXIMUM AIRSPEED:	.96 MACH	ESTIMATED DATE OF FIRST FLIGHT:	JULY 21, 1999
FLIGHT CEILING:	1,200 AGL	ESTIMATED IOC:	OCTOBER 1, 1999
MAXIMUM G'S:	6.5	TOTAL UNITS PURCHASED:	635

*NOT RECOMMENDED FOR FREQUENT CARRIER FLIGHT DECK USEAGE

United States General Accounting Office

GAO

Report to the Chairman, Committee on
Armed Services, House of Representatives

September 1988

CLOSE AIR SUPPORT

Status of the Air Force's Efforts to Replace the A-10 Aircraft

GAO
United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-231215

September 2, 1988

The Honorable Les Aspin
Chairman, Committee on
Armed Services
House of Representatives

Dear Mr. Chairman:

This report, which was prepared at your request, addresses the status of the Air Force's efforts to replace its primary close air support aircraft, the A-10. A separate report (GAO/NSIAD-88-210) addresses the Air Force's efforts to upgrade its A-7 aircraft.

As arranged with your Office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of the report. At that time we will send copies to interested congressional committees; the Secretaries of Defense, the Air Force, and the Army; the Director, Office of Management and Budget; and other interested parties.

Sincerely yours,

Harry R. Finley
Senior Associate Director

Executive Summary

Purpose

The Department of Defense is considering replacement options for the Air Force's primary close air support aircraft, the A-10. The Air Force is concerned about the A-10's ability to support the Army and survive the Soviet air defense threat of the 1990s and beyond. The Congress may soon face some major funding decisions on the A-10 replacement.

The Chairman of the House Committee on Armed Services asked GAO to identify close air support requirements and review the Air Force's plans to replace or upgrade its close support aircraft, the A-10 and the A-7. This report addresses the A-10 replacement; the A-7 upgrade is addressed in a separate report. GAO discusses these efforts in separate reports because the issues associated with each are sufficiently different and significant.

Background

The A-10, developed in the early 1970s, is the Air Force's primary aircraft designed specifically to provide close air support to Army ground forces. According to the Air Force, the Soviet air defense threat in the 1990s will be considerably greater than it is today. Moreover, the U.S. Air Force will be required to perform more operations at night and in adverse weather and provide support to Army troops deep behind enemy lines.

The Air Force wants to start replacing the A-10 in 1993 because of its minimal capability at night and in adverse weather and its vulnerability to enemy air defenses, which would be especially intense behind enemy lines.

Results in Brief

The Air Force's aircraft requirements for the A-10 replacement are derived from Army air support requirements. Simply stated, the Army's requirements specify a need for both air support against targets near friendly forces (close air support) and attacks on enemy follow-on forces before they can reinforce or replace troops at the front (battlefield air interdiction).

After evaluating A-10 replacement options, the Air Force recommended to the Department of Defense that it replace the A-10s with modified F-16s, referred to as A-16s. However, the Department was concerned that the Air Force may not have sufficiently considered all viable aircraft alternatives or adequately emphasized the close air support mission and directed it to conduct another study of alternative aircraft designs. The Air Force, along with aircraft manufacturers, is currently conducting that study.

Until the Department of Defense approves the A-10 replacement aircraft, the cost, replacement schedule, and resulting force structure changes remain uncertain.

Principal Findings

Emphasis on Close Air Support and Battlefield Air Interdiction

In the course of its present study, the Air Force (in cooperation with the Army) developed the most comprehensive statement of air support requirements to date. These requirements include specific scenarios of anticipated battle conditions for nine missions that emphasize close air support. The requirements have been provided to aircraft manufacturers as criteria for A-10 replacement designs.

The Army and the Air Force foresee close air support and battlefield air interdiction becoming similar in the future from a timing and coordination standpoint. As with close air support, they believe battlefield air interdiction will require detailed coordination and a more immediate response to identified targets. Thus, the Air Force sees a need for a more flexible aircraft to meet this requirement.

Air Force Aircraft Replacement Timetable

The Air Force wants to begin replacing its A-10s beginning in 1993, which is earlier than their service or structural life requires. This early date dictates that an existing or in-production aircraft will be selected as a replacement because a new aircraft would require 9 to 11 years to develop. One key reason the Air Force chose this date is because of the need to provide close air support to ground forces during attacks on enemy follow-on forces. However, according to Army officials, such operations cannot be effectively conducted until new surveillance and target acquisition systems are fielded. These systems are scheduled to be available for use in the mid- to late 1990s.

The Air Force started converting some A-10s to a forward air control role in 1987. Although plans call for converting 120 A-10s by the late 1990s, further conversion, according to Air Force officials, is contingent on the A-10 replacement effort.

Cost and Budget of Replacement

Cost estimates for replacing the A-10 vary considerably. Development costs are estimated from $110 million for the A-16 to $2.5 billion for a new aircraft. Production costs per unit are estimated at $7 million to $12 million (1985 dollars) for existing aircraft and from $8 million to $30 million (1988 dollars) for new aircraft.

The total cost of the A-10 replacement is difficult to estimate until key decisions on aircraft and schedule are made. The final report from the Department of Defense directed study is scheduled to be available in December 1988. According to a Department official, the Air Force budget request for fiscal year 1990 may include funds for an A-10 replacement even if the final decision on the aircraft has not been made.

Force Structure Implications

The decision on the A-10 replacement will affect the Air Force's tactical force structure. A decision to develop a new aircraft could require that the existing A-10s be maintained in the force until the late 1990s and delay the planned conversion of the A-10s to a forward air control role. Instead of maintaining the A-10s in the force over this period, the Air Force could replace them with existing F-16s.

Recommendations

This report makes no recommendations.

Agency Comments

The Department of Defense essentially concurred with the report (see app. I). It provided updated data and explanatory and other technical comments, which GAO has included in the report as appropriate.

The Department stated that the Office of the Secretary of Defense is currently considering an A-10 upgrade in ongoing studies that are separate from the Air Force's study of alternative aircraft designs. According to the office, maintaining the A-10 in the force structure or upgrading it remain options.

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Abbreviations

BAI	battlefield air interdiction
CAS	close air support
CASADA	Close Air Support Aircraft Design Alternative
MRP	mission requirements package
NATO	North Atlantic Treaty Organization
OSD	Office of the Secretary of Defense
TAC	Tactical Air Command

Chapter 1

Introduction

The Air Force has traditionally provided tactical air support to forces involved in ground operations. The A-10, developed in the early 1970s, is the Air Force's primary aircraft designed specifically to provide close air support to ground forces.

The Air Force, however, is concerned that the A-10 will not survive the Soviet air defense threat projected for the 1990s. Thus, in 1984 it began to evaluate aircraft options to the A-10 that would improve the Air Force's ability to support future ground operations. In December 1986, the Air Force recommended two initiatives to the Office of the Secretary of Defense (OSD): (1) upgrade the Air National Guard's A-7 aircraft and (2) replace the A-10s with modified F-16s (to be called A-16s) designed specifically to provide air support to the Army. OSD officials were concerned that the Air Force had not fully considered all viable alternatives for replacing the A-10 aircraft. Accordingly, OSD approved the development and testing of two upgraded A-7 aircraft prototypes and directed the Air Force to study alternative aircraft designs to support the future ground operations.

Army and Air Force Doctrine and Guidance for Air Support

The requirements for air support to ground operations are described in the Army's basic war fighting doctrine, AirLand Battle. This doctrine requires that tactical air forces support the Army by attacking enemy ground forces in contact with friendly forces and enemy forces held in reserve.

Air Force doctrine specifically establishes missions to support the U.S. and allied forces. Tactical air missions support the Army's AirLand Battle, and the close air support (CAS) and air interdiction missions most directly support ground operations.

CAS missions provide aerial firepower against enemy forces in close proximity to friendly forces. This action is requested by a land commander when a variety of hostile targets in close proximity pose a threat or obstacle to planned and ongoing operations. The ground forces determine which targets will be attacked during a CAS mission, thus requiring detailed integration with the supported forces is required.

Air Force doctrine further explains that air interdiction is to delay, disrupt, divert, or destroy the enemy's military potential before it can be used against friendly forces. The air support directed at follow-on forces that have a near-term effect on friendly land forces is considered a part of the air interdiction mission and is referred to as battlefield air interdiction (BAI).

The BAI mission is closely related to the CAS mission because it involves the air attack of enemy forces that could soon be in direct contact with friendly ground forces and requires close coordination and integration with a land commander. According to the Air Force, however, planning BAI missions currently requires about 24 to 48 hours once targets have been identified, which, according to Air Force and Army officials, may not be responsive enough in the future.

The North Atlantic Treaty Organization (NATO) is developing a war fighting concept that is generally consistent with both Army and Air Force doctrine in that its purpose is to impede the Warsaw Pact follow-on forces from reaching a battle when they want and at full strength. However, because NATO is a defensive alliance, it does not advocate the use of ground forces against enemy follow-on forces in Warsaw Pact territory, even though the Army's AirLand Battle doctrine does. NATO envisions using long-range weapons such as airplanes, artillery, and ground-launched guided missiles to attack enemy follow-on forces before they are engaged in direct combat with defending alliance ground forces.

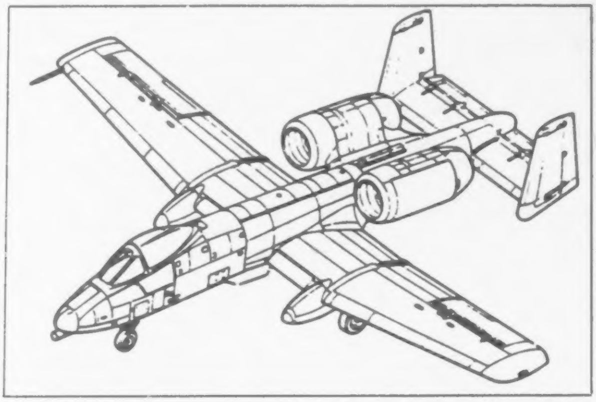
A-10 Mission and Status

The A-10 was developed specifically to perform CAS missions, although the Air Force considers any aircraft that is capable of delivering air-to-surface weapons as CAS capable. Air Force planning documents show that the A-10s make up about 64 percent of the Air Force's currently designated CAS aircraft. However, the A-10's current tasking is for both CAS and BAI, and, according to Air Force officials, pilots train for both missions.

The A-10 is a twin engine, single-seat aircraft that in a combat configuration, according to Air Force officials, can remain airborne up to 1.5 hours in a low tactics mission and has a mission radius of 300 miles, with 15 minutes in the target area. The A-10s can typically attain speeds of about 325 nautical miles per hour in a combat configuration. The aircraft has an internally mounted 30-mm 7-barrel cannon and can carry a large number and wide variety of weapons. (See fig. 1.1.)

The A-10 was first fielded in 1975, and the last one was delivered in March 1984. The Air Force purchased a total of 713 A-10s. The average age of the A-10 fleet is about 8 years, according to a Tactical Air Command (TAC) official responsible for force structure analysis. In November

Figure 1.1: A-10 Aircraft



1987, the Air Force's A-10 inventory totaled 655 aircraft. According to Air Force officials, the Air Force started converting A-10s to the forward air control role in October 1987, and complete conversion of about 120 aircraft is expected by the late 1990s.

Perceived A-10 Shortfalls Drive Search for Alternatives

According to Air Force officials, the A-10 is an effective CAS and BAI aircraft in a low- to mid-intensity air defense threat environment, such as Central and South America, and has some positive attributes such as a built-in 30-mm gun, excellent range, and the capacity to carry a large number of weapons. Also, according to the Air Force, it can sustain hits because of its redundant systems and armor protection against anti-aircraft fire.

Even though the Air Force recognizes the A-10's strengths, it is concerned about the A-10's ability to survive in an intense threat, such as in the central European battlefield of the 1990s, and to support Army ground operations. For example, the Air Force is concerned that the A-10 is too slow to be used in a package with other faster aircraft in attacks on enemy follow-on forces; therefore, it could not be counted on to support the Army's attack on follow-on forces with troops. Also, the Air Force is concerned about the A-10's lack of night and adverse weather capabilities and its ability to survive in the more lethal CAS and BAI environments.

Because of its concerns about the A-10's survivability and effectiveness, the Air Force evaluated aircraft options to the A-10. In 1984, shortly after the last A-10 was delivered, the Air Force initiated a "Close Air Support Investigation" to explore potential replacements. In 1985 the Air Force published a Request for Information, asking aircraft manufacturers to provide information on near-term alternatives to the A-10.

OSD also expressed concern over the A-10's effectiveness and directed the Air Force to conduct a feasibility study of aircraft to replace the A-10. The Close Air Support Aircraft Design Alternative study is being conducted with participation by aircraft manufacturers. The Air Force estimates the study will cost $9.4 million, which includes the cost to evaluate the final results.

As reflected in the Air Force's 1986 proposal to OSD and in TAC's fighter roadmap, the Air Force wants to start replacing the A-10s with A-16s in the early 1990s. However, until OSD approves a replacement aircraft, the cost, replacement schedule, and resulting force structure changes remain uncertain.

Congressional Concern

The National Defense Authorization Act for Fiscal Years 1988 and 1989, Public Law 100-180, requires the Secretary of Defense to submit to the Senate and House Committees on Armed Services a report containing a master plan for meeting the Secretary's requirements for CAS and BAI. The report is to specify the requirements with respect to equipment, costs, schedule, and acquisition strategy and the roles for active and reserve forces in each of the military services.

Recently, the Senate and House Committees on Armed Services, in their respective reports on the National Defense Authorization Act for Fiscal Year 1989, expressed concerns about Air Force efforts to modernize its CAS aircraft. The Senate Committee concluded that the

> "Air Force has devoted insufficient attention to the area of modernizing close air support. The Air Force has programmed to spend some $13 billion to develop a new generation air to air fighter, but has budgeted virtually nothing to develop a new generation replacement aircraft for close air support."

The House Committee said that the Department of Defense was not giving adequate consideration to the full range of aircraft options that may be available. It strongly recommended that all CAS candidates, including an upgraded A-10 and the AV-8B Harrier, the Marine Corps' CAS aircraft, should receive due consideration.

Objectives, Scope, and Methodology

In April 1987, the Chairman, House Committee on Armed Services, requested that we evaluate the CAS mission requirements and the Air Force's plans for meeting those requirements. In subsequent meetings with Committee representatives, we agreed to identify the Army's requirements and review Air Force plans to replace or upgrade its primary CAS and BAI aircraft, the A-10 and A-7. This report only addresses the CAS requirements and the Air Force's plans to replace the A-10; a separate report addresses the A-7 issues. We discuss these efforts in separate reports because the issues associated with each are sufficiently different and significant.

We reviewed the Army's CAS requirements and the extent to which these mission requirements have been defined. We also reviewed the Air Force's and OSD's plans and processes to identify alternatives to the A-10.

To accomplish this review, we interviewed and obtained data from officials at the following locations:

- Office of the Secretary of Defense, Washington, D.C., for information on the direction and expected results of the current A-10 replacement study;
- Air Force Headquarters, Washington D.C., for information on the need to replace the A-10 and alternative study efforts;
- Tactical Air Command, Langley Air Force Base, Virginia, for mission and aircraft requirements information and justification for and implication of replacing the A-10;
- Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, for information on the current and past studies on A-10 replacement aircraft;
- Armament Division, Air Force Systems Command, Eglin Air Force Base, Florida, for information on weapons development for CAS and involvement in studies to replace the A-10;
- Air Force Logistic Center, McClellan Air Force Base, California, for information on A-10 modifications and service life;

- Army Headquarters, Washington D.C., for information on CAS requirements and Army involvement in the current CAS aircraft alternatives study;
- Training and Doctrine Command, Fort Monroe, Virginia, for information on the battlefield of the 1990s and the Army's need for CAS;
- Institute for Defense Analyses, Alexandria, Virginia, for information on studies on alternative A-10 replacement aircraft.

We also obtained operational perspectives on requirements for air support to ground forces at Headquarters, United States Army Europe, Heidelberg, West Germany; Headquarters, VII Corps, Stuttgart, West Germany; Headquarters, V Corps, Frankfurt, West Germany; and the Army National Training Center, Fort Irwin, California.

In addition, operational perspectives on the A-10 and alternative aircraft were obtained at Headquarters, United States Air Forces in Europe, Ramstein Air Force Base, West Germany; 354th Tactical Fighter Wing, Myrtle Beach Air Force Base, South Carolina; 388th Tactical Fighter Wing, Hill Air Force Base, Utah; Tactical Fighter Weapons Center, Nellis Air Force Base, Nevada; 57th Fighter Weapons Wing, Nellis Air Force Base; 4440th Tactical Fighter Training Group, Nellis Air Force Base; 355th Tactical Training Wing, Davis-Monthan Air Force Base, Arizona; 602nd Tactical Air Control Wing, Davis-Monthan Air Force Base; and 35th Tactical Training Wing (Air Warrior), George Air Force Base, California.

Our work was conducted in accordance with generally accepted government auditing standards. The Department of Defense provided comments on a draft of this report. These comments have been included in the report as appropriate and are presented in appendix I.

Army Requirements for Air Support

The Army derives its requirements for air support from its AirLand Battle doctrine, which has evolved to counter the Warsaw Pact's method of attack and the superior numbers of troops and weapons in central Europe. As envisioned for the 1990s, air support near friendly troops would be employed (1) deeper behind enemy lines, (2) against far more intense air defenses, (3) at night and in adverse weather, and (4) immediately as needed. The Army also recognizes the need for air support in other geographical areas where a battle may not be as intense.

Battlefield of the 1990s

Army doctrine states that any major conflict will involve Soviet battle doctrine either directly or indirectly through Soviet allies using Soviet equipment and strategies. U.S. Armed Forces are required to be prepared to meet potential military challenges worldwide, ranging from low-intensity operations such as terrorist threats to mid- to high-intensity operations such as a Warsaw Pact or Soviet invasion. Although the Army war fighting doctrine acknowledges other threats, it concentrates on how to counter the threat posed by Warsaw Pact forces in the mid- to high-intensity conflicts.

The Army doctrine further explains that the Warsaw Pact is expected to establish momentum rapidly by employing superior numbers of troops and equipment in offensive operations. The Warsaw Pact strategy would include a rapid, mobile offensive conducted by succeeding waves of ground forces. This strategy would require timely reinforcements from follow-on forces to maintain momentum at the front lines of battle. Therefore, Warsaw Pact success would depend on the smooth flow of troops and equipment from the rear area.

The U.S. Army developed AirLand Battle to counter the Warsaw Pact's strategy. According to Army doctrine, if U.S. forces can interrupt the timely flow of reinforcements while maintaining solid defenses at the front line, Warsaw Pact forces at the main battle area will lose momentum and will eventually be forced to surrender or retreat. An important part of the AirLand Battle doctrine is the attack of follow-on forces beyond the front lines through such means as artillery, air interdiction, and operations involving ground troops.

Army doctrine characterized the anticipated mid- to high-intensity battlefield environment as being chaotic, intense, and highly lethal. It does not expect the front lines to be the traditional, relatively straight boundary separating the friendly troops from the enemy, but to be fluid and non-linear.

The Army doctrine incorporates plans to fight at night and in all weather conditions. According to the Army, this technological edge could provide the allied forces with opportunities to destroy high-priority targets at night, which is when the targets will be most vulnerable due to degraded night capabilities.

Army doctrine also recognizes a need for tactical air support in low-intensity conflicts such as those that could arise in Central America. It defines low-intensity conflict as "...the low end of the conflict spectrum...[that] will pit the Army forces against irregular or unconventional forces, enemy special operations forces, and terrorists." The Army plans to use special operations forces that can deploy rapidly and exercise restraint in the military response. It expects the enemy would attack at an unpredictable, intermittent pace occurring any hour of the day and under any weather conditions with forces that will be camouflaged in small units, dispersed and fleeting, and difficult to locate. According to the Army, the air defense threat in these conflicts would not be as intense as the central European threat, although it could involve technologically advanced weapons.

Army Requirements for Air Support to Ground Forces

The AirLand Battle doctrine recognizes a need for tactical air support across the entire spectrum of the battlefield. In a 1985 memorandum of agreement, the Army and the Air Force agreed that CAS needs to be effective

> "...on the non-linear battlefield across a broad spectrum of combat scenarios and threats ranging from the friendly rear area to the traditional main battle area and the deep maneuver arena."

In an April 1987 briefing to OSD, the Army presented its tactical air support requirements. These included high sortie rates, responsiveness, the ability to survive and penetrate enemy defenses, the ability to operate under the weather day and night, the capability to carry a wide variety of weapons in sufficient quantities to be effective, and the flexibility to provide support across the entire spectrum of the battlefield.

Air Force officials noted that aircraft capable of performing future CAS missions would have characteristics required of air interdiction aircraft. The Air Force believes these characteristics would include high subsonic speed and maneuverability that allows the aircraft to avoid air defense threats.

The Army indicated a need for responsive and concentrated firepower from CAS aircraft. On the defense, the Army envisions primary CAS targets as tactically deployed moving or stationary tanks, mounted or dismounted infantry, and supporting artillery. On the offense, primary targets will include tanks, command and control vehicles, and mounted or dismounted infantry.

The Army indicated the need for more timely attack on BAI targets. Officials at the Army's Training and Doctrine Command noted that enemy artillery units would be one of the European Command's highest priority targets in a European conflict because enemy artillery would vastly outnumber friendly artillery. Because of this lack of sufficient friendly artillery, the Army will look to the Air Force to kill some of these targets. However, Air Force and Army officials have expressed concern that the current system requires 24 to 48 hours to schedule and execute missions against BAI targets and, as a result, is not responsive enough to attack enemy artillery when needed.

Although operations against enemy follow-on forces involving ground forces is a part of current Army doctrine, Army officials told us that the Army may not be able to implement the doctrine effectively until the late 1990s. Effective implementation of these operations will require the fielding of surveillance, targeting, and weapons systems that are under development, such as the Joint Surveillance Target Attack Radar System and the Army Tactical Missile System. The Office of Technology Assessment's June 1987 study, New Technology for NATO Implementing Follow-on Forces Attack, reached a similar conclusion about conducting these operations. It found that

> "NATO currently has some quite limited capability to implement this concept [i.e., attack of follow-on forces], but faces three major shortcomings: adequate resources for reconnaissance, surveillance, and target acquisition; capable munitions in sufficient quantities as well as the weapons to distribute those munitions; and total systems—from surveillance to target destruction—that can respond rapidly, flexibly, and effectively across large areas."

Army and Air Force officials said the Joint Surveillance Target Attack Radar System was the primary system needed for a fully effective capability to attack follow-on forces. Originally, the Air Force planned to begin fielding this system in 1993, but this date has slipped to about 1996 due to technology development delays and budget constraints.

Chapter 3

Air Force Efforts to Meet Army's Air Support Requirements

Because of its concern over the A-10's ability to meet the Army's tactical air support requirements effectively, the Air Force assessed aircraft options and recommended replacing the A-10 with the A-16. However, OSD did not concur with this recommendation and tasked the Air Force with conducting the current Close Air Support Aircraft Design Alternative study to further assess alternative replacement aircraft to the A-10. As part of the study, the Air Force and the Army developed the most comprehensive statements of tactical air support requirements to date, which are part of the study's mission requirements package (MRP).

The study results are scheduled to be briefed to the Close Air Support Mission Area Review Group by September 1988, about 5 months later than planned because of unexpected delays in finalizing the MRP. The Air Force expects the total study cost to be about $9.4 million. OSD plans to use the study results in additional analyses to determine whether or not a new aircraft is more cost effective and survivable than a derivative of an existing aircraft.

Air Force Concerns About A-10s

Even though Air Force officials spoke favorably of the A-10's effectiveness in low- to mid-intensity conflicts, they questioned its effectiveness in a high-intensity conflict, such as one that would be encountered in central Europe. Air Force officials were most concerned about the A-10's survivability, given the increasing number and lethality of Warsaw Pact air defense systems being fielded or planned for the 1990s. The projected threat includes a combination of anti-aircraft artillery with improved radar, improved infrared and radar-controlled surface-to-air missiles, emerging laser and radar frequency energy weapons, improved Soviet air-to-air fighters, and improved Soviet counter air threat.

In October 1987 United States Air Forces in Europe completed a threat analysis for the A-10 in the European central region that supports the Air Force's concerns about the A-10's ability to survive the increasing air defense capabilities of the Warsaw Pact forces. This analysis, which addressed the current and future Soviet threat to the A-10 in this region, "...suggests that the A-10 is rapidly becoming less survivable on today's battlefield." According to Air Force officials, the A-10's relatively slow speed and inability to maintain speed and acceleration in tight turns increase its vulnerability to the lethal hits in this environment. The slower the aircraft's speed, the longer the aircraft is exposed to the air defense weapons.

According to the Air Force, another major shortfall is the A-10's limited night and adverse weather capabilities. Although the Air Force planned to equip the A-10 with the Low Altitude Navigation and Targeting Infrared for Night system, which would provide night and adverse weather capabilities, the Air Force decided against it because of the system's high cost. Thus, as currently configured, the A-10 can only perform limited night operations with the use of phosphorous flares to illuminate the target area. In addition, it does not carry any type of forward-looking infrared equipment, which is needed for effective night CAS operations. Furthermore, the A-10 lacks terrain avoidance avionics, which would require night CAS operations to be flown at higher-than-desired altitudes to avoid collisions with the ground, thus increasing exposure to enemy air defense units. Similar problems are encountered with CAS operations in adverse weather that would limit pilot visibility for flight safety and target acquisition.

Finally, Air Force officials expressed concern about the A-10's ability to support the Army in its attack on follow-on forces with troops and for more timely BAI. In such operations, attacking aircraft are expected to encounter high-intensity air defense threats in route to, from, and in the target area. According to Air Force officials, most aircraft would have difficulty surviving this threat without assistance in suppressing air defenses. Air Force officials viewed the A-10 as being too slow to accompany faster aircraft that may be required to suppress enemy air defenses.

CAS requires an immediate response against targets and detailed coordination between the Army ground unit and Air Force aircraft. According to the Air Force, BAI not only requires detailed coordination between air and land commanders but also 24 to 48 hours to plan. Both the Army and the Air Force foresee a need for a more immediate response to BAI targets, and officials from both services stated that CAS and BAI missions are becoming similar from a timing and coordination standpoint. Thus, they see an advantage for the land commander to have access to a flexible aircraft that can perform both missions effectively.

Prior Air Force Assessments of Aircraft Options

In April 1985 the Air Force issued a report entitled Close Air Support Investigation which was the culmination of a 6-month "quick-look" at designs for primarily new, fixed-wing CAS aircraft for the mid- to late-1990s. Four aircraft manufacturers—Boeing Military Airplanes, Fairchild Republic Company, Northrop Corporation, and Rockwell International—submitted conceptual aircraft designs in response to the Air Force's request for information.

After evaluating the designs, which included a modified A-10, the Air Force reported that (1) the A-10 without extensive improvements would lose its effectiveness in the CAS role in the mid-1990s due to, among other things, increased threat, (2) the CAS issue required further analysis before the optimum solution could be identified, and (3) modifications to aircraft such as the F-16 should be considered to examine their feasibility and cost effectiveness in the future CAS role.

The investigation found

> "Survivability is the key issue and requires a combination of moderately low signatures, hardening, systems for threat avoidance and on-board defense suppression, and crew protection as well as high performance and maneuverability at high subsonic speed (Mach 0.7-0.85) and low altitude (approximately 200 ft)."

The Air Force then assessed modifying aircraft for the CAS and BAI missions for two reasons: cost and time. According to Air Force officials, the tactical aircraft development priority is the Advanced Tactical Fighter, and the Air Force cannot afford to fund two development projects concurrently. They fear that any additional developmental efforts would divert funds from the advanced fighter. Air Force officials also noted that, historically, new aircraft development efforts take about 10 years to complete before any production aircraft become available. This time frame is not compatible with the Air Force's desire to have the follow-on aircraft available by 1993 and restricts the options to modifying existing or in-production aircraft.

In April 1985 the Air Force issued a request for information to industry to obtain design alternatives for a follow-on aircraft that could perform both the CAS and BAI missions and could be available for production beginning in the late 1980s. The solicitation noted that the need for a CAS aircraft does not warrant the delay and expense of a totally new development effort and that the focus of the study should be on modifying aircraft.

Four contractors responded with proposals—General Dynamics with an F-16 derivative, LTV Corporation with a modified A-7, Northrop Corporation with the F-20, and McDonnell Douglas Corporation with the AV-8B. Subsequently, in December 1986, the Air Force recommended two initiatives to OSD. The first was to upgrade the Air National Guard's A-7 aircraft, and the second was to replace the A-10 with the A-16.

OSD authorized the development and testing of two modified A-7 prototypes, but it did not approve replacing the A-10s with A-16s. OSD officials were concerned that the Air Force had not considered all the viable alternatives to the CAS and BAI issue, especially the possibility of developing a low-cost aircraft used only for CAS. OSD wants to ensure that the aircraft selected to replace the A-10 is the most cost-effective aircraft for the CAS mission. However, OSD recognized that aircraft able to perform CAS missions and survive the battlefield of the 1990s will have characteristics that will enable it to perform BAI missions.

The Air Force's Scientific Advisory Board also raised concerns about the follow-on aircraft. It concluded that CAS and BAI missions are sufficiently different for each to warrant a separate aircraft and emphasized that "the mission should dictate the aircraft rather than vice versa." The Board also expressed a concern over the lack of progress in CAS weapon development efforts, noting that "...weapons (and their required avionics) cannot continue to be treated as an afterthought to aircraft and propulsion." In its comments on our report, the Department of Defense stated that the paucity of CAS weapons and large inventory of 30-mm ammunition make the A-10 look very attractive.

Close Air Support Aircraft Design Alternative Study

As a result of its concerns, OSD directed the Air Force to perform the Close Air Support Aircraft Design Alternative (CASADA) study and established OSD controls over the study. In February 1987 OSD established the Close Air Support Mission Area Review Group to oversee the study, noting that it will be developed and monitored by OSD, the Joint Chiefs of Staff, the Air Force, and the Army. This review group has the authority to control study funding and to review and approve the statement of work and the mission requirements document before release to contractors.

Study Approach

The Air Force designed a three-phase approach to the study. Phase 1 problem definition, was the Air Force's responsibility. It included developing a comprehensive definition of the CAS and BAI mission requirements and culminated in a detailed mission requirements document. The Army defined its requirements for CAS and BAI missions, which assisted the Air Force in completing its work for this phase. Phase 2, aircraft design concept development, is the aircraft manufacturers' responsibility and involves developing and evaluating alternative aircraft designs. These are initial conceptual paper designs and data packages, not fully developed blueprints ready for the production line. Phase 3, aircraft alternatives assessment, is also the Air Force's responsibility and will include assessing the reasonableness of the designs and submitting the assessments to the review group.

Study Schedule Delayed

According to the CASADA study's original schedule, contracts were to be awarded by August 1, 1987, and the study was to be completed by September 1988. However, delays in finalizing the MRP caused about a 5-month slip in the contract award dates and postponed the completion date to December 1988.

Finalizing the MRP took longer than the Air Force anticipated. According to Air Force officials, Air Force Headquarters received the draft MRP for approval on July 27, 1987, after the CAS and BAI mission requirements had been coordinated with various cognizant Air Force and Army organizations such as TAC and the Army's Training and Doctrine Command. Air Force Headquarters requested additional information on Army requirements and battlefield scenarios.

OSD recommended changes to the Air Force in a November 17, 1987, letter. These changes included inserting design-to-cost guidance and specific aircraft performance parameters. According to Air Force and OSD officials, compromises were reached on the recommendations. For example, the Air Force inserted a low design-to-cost figure of $7 million but not an upper limit cost figure. The MRP was finally approved for release to aircraft manufacturers in December 1987.

Study Cost

According to the CASADA project manager, the study will cost about $9.4 million—about $4.85 million for aircraft manufacturers and $4.55 million for in-house study design, MRP development, final design assessments, and OSD's evaluation of the CASADA study results.

The Air Force received proposals from nine manufacturers and awarded fixed-price contracts to six, as shown in table 3.1. Aircraft manufacturers not selected were Fairchild Republic Company, LTV Corporation, and Sikorsky Aircraft Corporation. Fairchild presented a modified A-10; LTV an austere, nominal performance new design; and Sikorsky a new design with an X-wing, rotor concept.

Table 3.1: CASADA Study Contract Prices

Aircraft manufacturers	Total award
Boeing Military Airplanes	$839,500
General Dynamics Corporation	1,000,000
Lockheed Corporation	750,850
McDonnell Douglas Corporation	750,000
Northrop Corporation	755,546
Rockwell International Corporation	750,000
Total	**$4,845,896**

Study Results

According to the CASADA program manager, the Air Force expects to get about 20 aircraft designs from the study; one will be General Dynamic's modified F-16. General Dynamics' contract is to design a totally new aircraft and a modified F-16. The remaining contractors are to design only new aircraft.

The Air Force plans to assess the reasonableness of the manufacturers' designs and evaluations in comparison to MRP requirements. It does not plan to rank the designs. The contractors' designs and evaluations and the Air Force's assessments will be provided to the review group for further evaluation.

According to OSD officials, two contractors will compare 5 to 10 of the manufacturers' designs with current aircraft to determine the designs that best meet mission requirements. The contractors will compare aircraft designs for survivability, effectiveness, and cost.

Mission Requirements

Before the CASADA study, CAS requirements were not clearly defined. The Air Force's Aeronautical Systems Division at Wright-Patterson Air Force Base, which analyzed the proposals from the 1985 solicitation, concluded that all the proposed design alternatives were technically viable candidates and that it was difficult to eliminate a candidate because CAS requirements were not clearly defined.

Since then, both the Army and the Air Force have more fully explained tactical air support requirements. For example, in April 1987 the Army provided OSD and the Air Force with statements of tactical air support requirements for both mid- to high-intensity and low-intensity conflicts based on AirLand Battle concepts. These requirements are the most detailed requirements developed to date and are included in the MRP, which participating manufacturers should use for phase 2.

The MRP is to provide "...a comprehensive data base of design and alternative mission requirements, aircraft force structure, capabilities, needs, ideas, aircraft, weapon, and avionics technologies...." Thus, the MRP listed, as did the 1985 solicitation, general CAS and BAI mission tasks, from which the aircraft manufacturers would develop their designs. These tasks were

- navigation,
- penetration of high-threat air defenses,
- communications interface with the Tactical Air Control System,
- target acquisition, and
- precision weapon employment.

In its comments on our report, the Department of Defense stated that the inclusion of BAI as a prime (rather than secondary) mission for the CASADA designs means the aircraft may be designed to the BAI requirements.

To clarify requirements further, the Air Force also included in the MRP battlefield scenarios for nine specific operational missions that it will use to evaluate the manufacturers' aircraft designs.

The Air Force also provided the manufacturers with aircraft design options to be considered in phase 2. These options were divided into three categories: (1) aircraft hardware requirements, (2) aircraft performance parameters, and (3) reliability, maintainability, and supportability requirements. Each category was further subdivided into specific detail, for example, aircraft hardware requirements specified communications and navigation features such as jam-resistant radios, digital communications capabilities, and automatic terrain avoidance systems.

Some of the design requirements for new aircraft are more stringent than those for modified aircraft. For example, under the reliability and maintainability requirements, combat turnaround time for new aircraft is 15 minutes versus 25 minutes for modified aircraft. Similarly, airlift support requirements for one squadron of new aircraft is 5 C-141B transport aircraft equivalents, whereas the requirement for one squadron of modified aircraft is 14 C-141B equivalents.

Chapter 4

Cost, Schedule, and Force Structure Implications of A-10 Replacement

The Air Force recommended replacing the A-10 aircraft with the A-16 to minimize cost and to have a replacement in the early 1990s. However, OSD and the Air Force are considering other alternative aircraft to the A-10. Regardless of the aircraft selected, this decision will affect both the Air Force's budget and force structure.

Cost and Budgetary Implications Unknown

The total program cost of the A-10 replacement is unknown and cannot be estimated until key decisions on the aircraft and its schedule are made.

According to the Air Force, developing CAS and BAI aircraft to replace the A-10 would require $2 billion to $2.5 billion. In its comments on the MRP, OSD's review group recommended that additional new aircraft designs be developed to meet unit cost constraints between $7 million and $13 million (fiscal year 1988 dollars). The CASADA study's MRP set a low unit cost limit of $7 million, but not an upper limit. According to the CASADA study program manager, the contractors involved in the CASADA study are projecting a unit cost that ranges from $8 million to $30 million (fiscal year 1988 dollars).

Contractors responding to the Air Force's 1985 request for information, which considered modifying in-production aircraft, estimated unit cost from $7 million to $12 million (fiscal year 1984 dollars). According to Air Force officials, the A-16 was estimated to cost about $110 million for development and about $13 million per aircraft (fiscal year 1986 dollars).

Because the CASADA study is underway and no decisions on the A-10 replacement have been made, Air Force officials are uncertain when funding for a replacement aircraft will be requested. However, in a March 21, 1988, hearing before the Senate Committee on Armed Services, the Chairman of OSD's Close Air Support Mission Area Review Group stated that such funds may be requested in the fiscal 1990 budget. This request, he noted, will be made even if the final decision on the replacement aircraft has not been made. In its comments on our report, the Department of Defense stated that it would reprioritize programs and/or use existing aircraft funding lines for procurement of a new CAS aircraft.

Schedule for Replacing A-10s

The Air Force wants to start replacing the A-10s in the CAS role as early as 1993, some 2 to 5 years sooner than the earliest A-10 retirement, based on its 20-year service life. This replacement would also occur much earlier than required by the A-10's structural life, which Air Force Logistics Command officials estimate will exceed the planned 20-year service life. However, the current CASADA study establishes two time frames for replacing the A-10: an upgraded, existing/in-production replacement aircraft by 1992 to 1995, and a new aircraft whose time frame will be determined by available technology and acquisition strategy.

According to Air Force officials, the Air Force started using A-10s as forward air control aircraft in 1987 and plans to change the mission for some 120 A-10s by the late 1990s. They also stated that the conversion is driven primarily by decisions on the A-10 replacement effort not by the need for early A-10 replacement.

The Air Force has not clearly stated why the 1993 time frame is critical. Some Air Force officials believed early replacement of the A-10 is needed to have an operational capability by the late 1990s. In a March 21, 1988, hearing before the Senate Committee on Armed Services, the Chairman of OSD's Close Air Support Mission Area Review Group stated that he was not sure that the mid-1990s date for replacing the A-10 is all that critical. However, Air Force studies show that enemy threat in the CAS and BAI arena is anticipated to increase significantly in the post-1994 time frame. Air Force studies also indicate that the survivability of the A-10 and other aircrafts will suffer due to this increasing threat.

According to Army officials, the Army will not be capable of conducting operations against follow-on forces with troops until the late 1990s, except on a limited scale. To perform this maneuver effectively, Army officials believed that the ability to see and plan deep into the battlefield is critical. This capability is expected to be improved significantly with the development of the Joint Surveillance and Target Attack Radar System, which is expected to be available for use in the mid- to late 1990s. Hence, the A-10's early replacement does not appear to be predicated on the Army's CAS needs beyond the front lines.

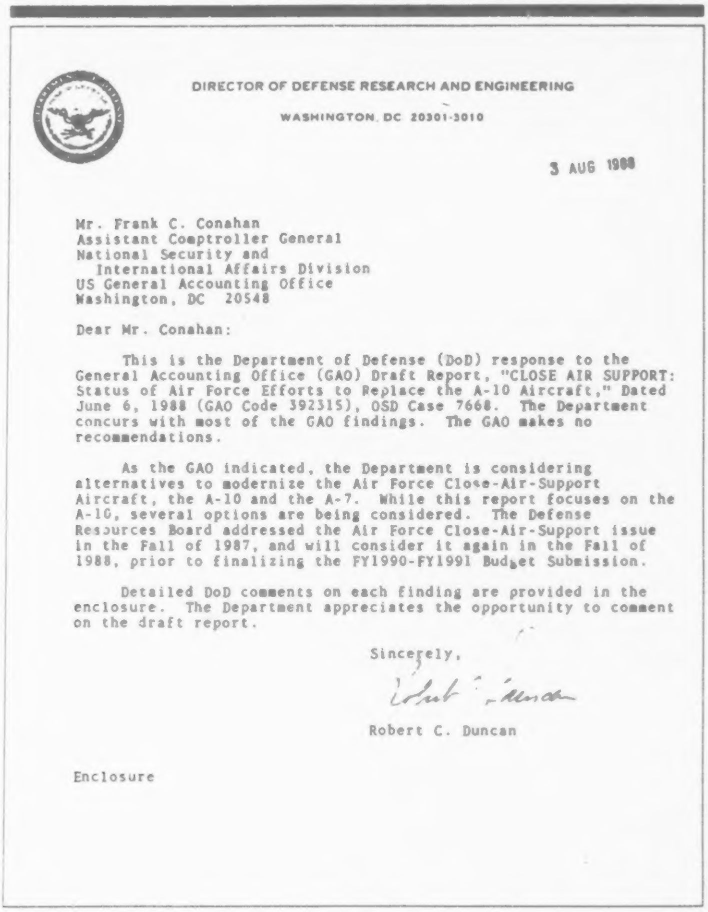
Force Structure Implications

The decisions on the A-10 replacement will affect the Air Force's tactical force structure. For example, a replacement aircraft, which could take about 9 to 11 years to develop, could require maintaining existing

A-10s in the force until the late 1990s. This, in turn, could delay the planned conversion of the 120 A-10s to a forward air control role. According to TAC officials, the Air Force plans to replace one Air National Guard unit's A-10s with F-16s in April 1989 and designate that unit's aircraft to perform the CAS and BAI missions.

The Air Force could also decide to replace the remaining A-10s with F-16s. If this occurs, about 50 percent of the tactical forces would consist of F-16-type aircraft by the year 2000, according to Air Force officials. Additionally, if OSD approves the A-16 as the A-10 replacement, the Air Force could see an earlier change in the tactical force structure than it would see if it decides to develop a replacement aircraft.

Comments From the Director of Defense Research and Engineering



DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, DC 20301-3010

3 AUG 1988

Mr. Frank C. Conahan
Assistant Comptroller General
National Security and
International Affairs Division
US General Accounting Office
Washington, DC 20548

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) Draft Report, "CLOSE AIR SUPPORT: Status of Air Force Efforts to Replace the A-10 Aircraft," Dated June 6, 1988 (GAO Code 392315), OSD Case 7668. The Department concurs with most of the GAO findings. The GAO makes no recommendations.

As the GAO indicated, the Department is considering alternatives to modernize the Air Force Close-Air-Support Aircraft, the A-10 and the A-7. While this report focuses on the A-10, several options are being considered. The Defense Resources Board addressed the Air Force Close-Air-Support issue in the Fall of 1987, and will consider it again in the Fall of 1988, prior to finalizing the FY1990-FY1991 Budget Submission.

Detailed DoD comments on each finding are provided in the enclosure. The Department appreciates the opportunity to comment on the draft report.

Sincerely,

Robert C. Duncan

Enclosure

GAO DRAFT REPORT - DATED JUNE 6, 1988
(GAO CODE 392315) OSD CASE 7668

"CLOSE AIR SUPPORT: STATUS OF AIR FORCE
EFFORTS TO REPLACE THE A-10 AIRCRAFT"

DEPARTMENT OF DEFENSE COMMENTS

* * * * *

FINDINGS

- FINDING A: Army and Air Force Doctrine and Guidance for Air Support. The GAO reported that the requirements for air support to ground operations are described in the Army's basic warfighting doctrine, AirLand Battle, which states that the Air Force must support the Army by attacking enemy ground forces in contact with friendly forces and enemy forces held in reserve. The GAO further reported that Air Force doctrine, in turn, establishes missions to support the Army. While all tactical air missions support the Army's AirLand Battle, the GAO found that two missions--close air support (CAS) and air interdiction--most directly support the Army ground operations. The GAO noted that Air Force doctrine sets forth the purpose of air interdiction as delay, disruption, diversion or destruction of the enemy's military potential before it can be brought to bear on friendly forces. In addition, the GAO explained the air support directed at targets that have a near-term effect on friendly land forces, is considered battlefield air interdiction (BAI) and is closely related to the CAS in that it also requires the air attack of enemy follow-on forces that have a near term effect on friendly ground forces. (pp. 3-4, pp. 9-10/GAO Draft Report)

Now on pp. 2-3, 8-9

  DOD RESPONSE: Concur. There are differences between CAS and BAI, especially in timing and coordination. The near term effect of BAI targets may not be as critical as the immediate effect of most CAS targets. Also, BAI may not require coordination with the local operating unit--it is not conducted in close proximity to friendly troops and coordination is generally accomplished through higher headquarters (such as Division).

- FINDING B: A-10 Mission and Status: Perceived A-10 Shortfall Drives Search for Alternatives. The GAO reported the A-10 is a twin engine, single seat aircraft that (1) can remain airborne up to 1.7 hours in the close air support role, (2) has a mission radius of 300 miles, and (3) can attain combat speeds of 438 miles per hour. The GAO found the A-10s make up about 66 percent of the currently designated CAS aircraft, although the A-10 current tasking includes both CAS and BAI and pilots train for both

Enclosure

missions. The GAO observed that the A-10 is an effective CAS and BAI aircraft in a low air defense threat environment, such as Central and South America, having some positive attributes, such as the capacity to carry a large number of weapons, a built-in 30mm gun, an excellent range and the ability to sustain hits because of its redundant systems and armor. While recognizing the A-10 strengths, the GAO found that the Air Force is nonetheless concerned about the A-10 ability to survive in an intense threat, such as in the Central European battlefield of the 1990s. The GAO further reported that the Air Force is also concerned because (1) the A-10 is too slow to be used in a package with other faster aircraft in attacks on enemy follow-on forces and (2) the A-10 lacks night and adverse weather capabilities. The GAO noted that, because of these concerns, the Air Force evaluated aircraft options to the A-10 and, in 1984, shortly after the last A-10 was delivered, initiated a "Close Air Support Investigation" to explore potential replacements. The GAO noted the Office of the Secretary of Defense (OSD) also expressed concern over the A-10 effectiveness and, in 1986, directed the Air Force to conduct a feasibility study of replacement aircraft. The GAO observed that the Close Air Support Aircraft Design Alternative study is currently being conducted, with participation by aircraft manufacturers, and will cost $8.5 million (not including the cost of evaluating the study results). The GAO also observed that, as reflected in the Air Force 1986 proposal to the OSD and in the Tactical Air Command fighter ROADMAP, the Air Force wants to start replacing the A-10s with A-16s in the early 1990s. The GAO concluded, however, that until the DoD approves a replacement aircraft, the cost, replacement schedule, and resulting force structure changes remain uncertain.
(pp. 2-4, pp. 10-12/GAO Draft Report)

Now on pp. 2-3, 9-11

DOD RESPONSE: Partially concur. The direction in 1986 to the Air Force was to initiate alternative design studies for a follow-on CAS aircraft other than the F(A)-16 recommended by the Air Force. The incent of this direction was and still is to determine if there is a more survivable and lower cost alternative to replacing the A-10. The A-10 can perform the BAI mission in low/mid-intensity conflicts. The maximum speed of the A-10 would be about 438 miles per hour; an operational speed with a weapons load is much lower. The combat speed of the A-10 with a typical combat load is approximately 375 miles per hour or 325 knots.

- FINDING C: Congressional Concerns. The GAO reported that the National Defense Authorization Act for FY 1988 and FY 1989 (Public Law 100-180) requires the Secretary of Defense to submit a report to the Senate and House Committees on Armed Services containing a master plan for meeting the Secretary's requirements for CAS and BAI. According to the GAO, the report will specify the equipment,

costs, schedule, requirements acquisition strategy and active reserve forces roles for each of the Military Services. The GAO observed that the Senate and House Committees on Armed Services, in their respective reports on the National Defense Authorization Act for FY 1989, expressed concerns about Air Force efforts to modernize CAS aircraft. The GAO specifically noted the House Committee concern that the DoD was not giving adequate consideration to the full range of available aircraft options and strongly recommending all CAS candidates receive due consideration, including an upgraded A-10 and the AV-8B Harrier (which is the Marine Corps close air support aircraft).
(p. 13/GAO Draft Report)

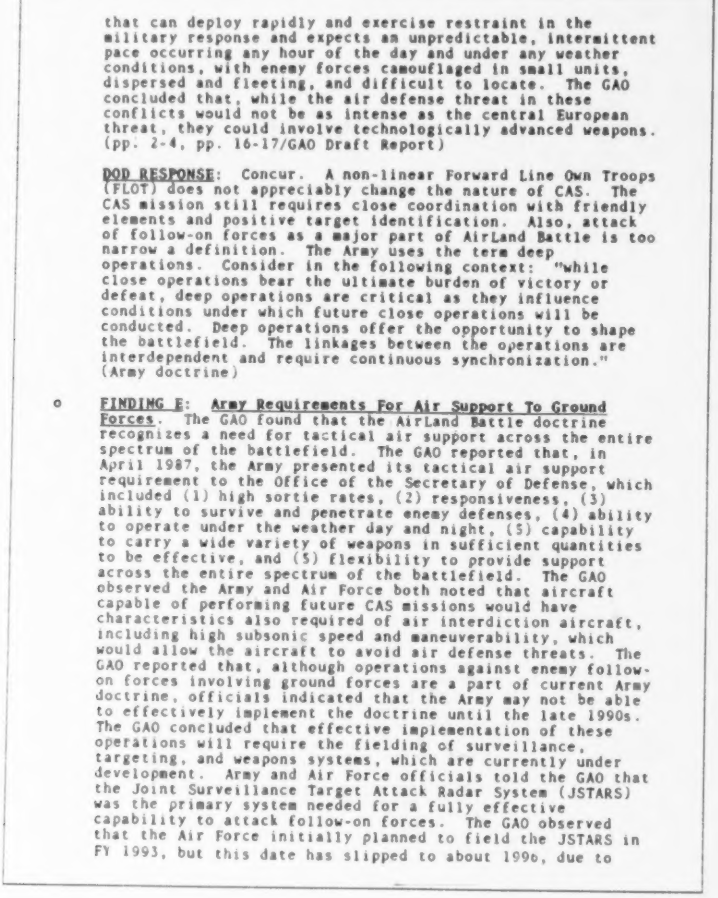
Now on pp. 11-12.

DOD RESPONSE: Concur

o **FINDING D**: **Battlefield of the 1990s**. The GAO reported that, according to Army officials, any major conflict in the 1990s will involve Soviet battle doctrine, either directly, or indirectly, through Soviet allies using Soviet equipment and strategies. The GAO observed that, as a result, U.S. Forces must be prepared to meet potential military challenges worldwide, ranging from low-intensity operations (i.e., terrorist threats) to mid-to high-intensity operations (such as a Warsaw Pact or Soviet invasion). The GAO further reported that, while acknowledging other threats, the Army warfighting doctrine has evolved to counter the threat posed by Warsaw Pact forces in the mid-to high-intensity conflicts and the Army developed AirLand Battle specifically to counter the Warsaw Pact strategy. The GAO observed it is the Army strategy that, if U.S. forces can interrupt the timely flow of reinforcements, while maintaining solid defenses at the front line, the Warsaw Pact Forces at the main battle area will lose momentum and eventually be forced to surrender or retreat. The GAO noted that a major part of the AirLand Battle doctrine, therefore, is the attack of follow-on forces, beyond the front lines, through artillery, air interdiction, and operations involving ground troops. The GAO observed that the Army has characterized this type of battlefield environment as chaotic, intense, and highly lethal. The GAO also observed that the Army does not expect the front lines to be the traditional, relatively straight, boundary separating the friendly troops from the enemy, but rather fluid and non-linear.

The GAO further reported the Army also recognizes a need for tactical air support in low-intensity conflicts, such as those that could arise in Central America. According to the GAO, the Army defines low intensity conflict, as "...the low end of the conflict spectrum...(that) will pit the Army forces against irregular or unconventional forces, enemy special operations forces, and terrorists." The GAO indicated the Army plans to use special operations forces

Now on pp. 2-3, 14-15.



that can deploy rapidly and exercise restraint in the military response and expects an unpredictable, intermittent pace occurring any hour of the day and under any weather conditions, with enemy forces camouflaged in small units, dispersed and fleeting, and difficult to locate. The GAO concluded that, while the air defense threat in these conflicts would not be as intense as the central European threat, they could involve technologically advanced weapons. (pp. 2-4, pp. 16-17/GAO Draft Report)

DOD RESPONSE: Concur. A non-linear Forward Line Own Troops (FLOT) does not appreciably change the nature of CAS. The CAS mission still requires close coordination with friendly elements and positive target identification. Also, attack of follow-on forces as a major part of AirLand Battle is too narrow a definition. The Army uses the term deep operations. Consider in the following context: "while close operations bear the ultimate burden of victory or defeat, deep operations are critical as they influence conditions under which future close operations will be conducted. Deep operations offer the opportunity to shape the battlefield. The linkages between the operations are interdependent and require continuous synchronization." (Army doctrine)

o **FINDING E**: **Army Requirements For Air Support To Ground Forces**. The GAO found that the AirLand Battle doctrine recognizes a need for tactical air support across the entire spectrum of the battlefield. The GAO reported that, in April 1987, the Army presented its tactical air support requirement to the Office of the Secretary of Defense, which included (1) high sortie rates, (2) responsiveness, (3) ability to survive and penetrate enemy defenses, (4) ability to operate under the weather day and night, (5) capability to carry a wide variety of weapons in sufficient quantities to be effective, and (5) flexibility to provide support across the entire spectrum of the battlefield. The GAO observed the Army and Air Force both noted that aircraft capable of performing future CAS missions would have characteristics also required of air interdiction aircraft, including high subsonic speed and maneuverability, which would allow the aircraft to avoid air defense threats. The GAO reported that, although operations against enemy follow-on forces involving ground forces are a part of current Army doctrine, officials indicated that the Army may not be able to effectively implement the doctrine until the late 1990s. The GAO concluded that effective implementation of these operations will require the fielding of surveillance, targeting, and weapons systems, which are currently under development. Army and Air Force officials told the GAO that the Joint Surveillance Target Attack Radar System (JSTARS) was the primary system needed for a fully effective capability to attack follow-on forces. The GAO observed that the Air Force initially planned to field the JSTARS in FY 1993, but this date has slipped to about 1996, due to

Now on pp. 15-16

technology development delays and budget constraints. (pp. 17-18/GAO Draft Report)

DOD RESPONSE: Partially concur. The Army did not comment on specific Air Force aircraft performance characteristics.

o FINDING F: Air Force Concerns About A-10s. The GAO reported that, even though Air Force officials spoke highly of the A-10 effectiveness in low- to mid-intensity conflicts, they assert its effectiveness in a high-intensity conflict (such as the one that would be encountered in central Europe) is questionable. According to the GAO, the Air Force is most concerned about the A-10 survivability, given the increasing number and lethality of Warsaw Pact air defense systems being fielded or planned for the mid-1990s. The GAO added that the projected threat includes a combination of anti-aircraft artillery with improved radar, improved infrared and radar controlled surface-to-air missiles, emerging laser and radio frequency energy weapons, and improved Soviet air-to-air fighters. The GAO noted that, in October 1987, the United States Air Forces Europe completed a threat analysis for the A-10 in the European central region, which supports the Air Force concerns about the A-10 ability to survive the increasing air defense capabilities of the Warsaw Pact forces. The GAO reported that the analysis addressed the current and future Soviet threat to the A-10 in this region, and "... suggests that the A-10 is rapidly becoming less survivable on today's battlefield." The GAO observed that the Air Force analysis addressed the following specific A-10 concerns:

- slow speed and inability to maintain speed and acceleration in tight turns, which increases the A-10s vulnerability to lethal hits in this environment, because the slower the aircraft speed the longer the aircraft is exposed to the air defense weapons;
- the limited night and adverse weather capability (although the Air Force planned to equip the A-10 with the Low Altitude Navigation and Targeting Infrared for Night System, which would have given it night and adverse weather capability, the Air Force decided against it because of the system's high cost); and
- the ability to support the Army in its attack on follow-on forces with troops and for more timely BAI, since attacking aircraft are expected to encounter high-intensity air defense threats in route to, from, and in the target area. (pp. 19-20/GAO Draft Report)

Now on pp. 17-18

DOD RESPONSE: Concur.

o FINDING G: Prior Air Force Assessments of Aircraft Options. The GAO reported that, in April 1985, the Air Force issued a report entitled, "Close Air Support Investigation," which culminated a 6-month "quick-look" at designs for primarily new, fixed wing CAS aircraft for the mid- to late-1990s. The GAO observed that four aircraft manufacturers--Boeing Military Aircraft Company, Fairchild Republic Company, Northrop Corporation, and Rockwell International--submitted conceptual aircraft designs in response to the Air Force request for information. The GAO found that, after evaluating the designs, the Air Force reported (1) the A-10 would lose its effectiveness in the CAS role in the mid-1990s (due to the increased threat), unless the aircraft receives extensive improvements, (2) the CAS issue required further analysis before the optimum solution could be identified, and (3) modifications to aircraft, such as the F-16, should be considered to examine their feasibility and cost-effectiveness in the future CAS role. The GAO observed that the tactical aircraft development priority is the Advanced Tactical Fighter and the Air Force cannot afford to fund two development projects concurrently. According to the GAO, the Air Force is concerned that any additional developmental efforts would divert funds from the advanced fighter. The GAO noted that, historically, new aircraft development efforts take about 10 years to complete before any production aircraft become available, which is not compatible with the Air Force desire to have the A-10 follow-on aircraft available by 1993, and restricts the options to modifying existing or in-production aircraft. The GAO found that, beginning in the late 1980s, four contractors responded with proposals--General Dynamics with an F-16 derivative, LTV Corporation with a modified A-7, Northrop Corporation with the F-20, and McDonnell Aircraft Company with the AV-8B. The GAO reported that, in December 1986, the Air Force recommended two initiatives to the Office of the Secretary of Defense--(1) upgrade the Air National Guard A-7 aircraft and (2) replace the A-10 with the A-16. The GAO found that the OSD authorized the development and testing of two modified A-7s, but did not approve replacing the A-10s with A-16s because OSD officials were concerned the Air Force had not considered all the viable alternatives to the CAS and BAI issue, especially the possibility of developing a low cost CAS-only type aircraft. The GAO added that the Air Force Scientific Advisory Board (SAB), which concluded the CAS and BAI mission are sufficiently different for each to warrant a separate aircraft, also raised concerns about the follow-on aircraft. (pp. 2-5, pp. 20-22/GAO Draft Report)

Now on pp. 2-3, 19-20

DOD RESPONSE: Partially concur. An A-10 upgrade also has been considered and currently is being considered in ongoing studies. In reference to the SAB concern over CAS weapons (defined as direct fire/minimal collateral damage), the paucity of CAS weapons combined with the large inventory of 30mm ammunition makes A-10 retention very attractive. In addition, two aircraft development projects could occur concurrently if each had the appropriate priority to be funded in the Air Force budget.

- FINDING H: Close Air Support Aircraft Design Alternative Study. The GAO reported that, concerned because the Air Force may not have sufficiently considered all viable aircraft alternatives or adequately emphasized the CAS mission, the OSD directed the Air Force to perform the Close Air Support Aircraft Design Alternative (CASADA) study and also established controls over the study. The GAO found that the OSD review group was given the authority to control study funding and to review and approve the statement of work and the mission requirements document before release to the contractors.

  - Study Approach. The GAO learned that the Air Force designed a three-phase approach to the study, as follows:

    1. problem definition;

    2. aircraft design concept development; and

    3. aircraft alternatives assessment.

  - Study Schedule Delayed. The GAO found that the CASADA study original schedule called for awarding contracts by August 1, 1987, and for completing the study by March 30, 1988; however, delays in developing the mission requirements package (MRP) caused about a 5-month slip in the contract award dates and a corresponding slip in the completion date to September 1988.

  - Study Cost. The GAO reported that, according to the CASADA project manager, the study will cost about \$8.5 million--about \$4.85 million for aircraft manufacturers and \$3.65 million for in-house study design, MRP development, and design assessments.

  - Study Results. The GAO noted that the Air Force expects to get about 20 aircraft designs from the study, one of which will be the General Dynamics modified F-16.

The GAO explained that the Air Force plans to assess the reasonableness of the manufacturer designs and evaluations in comparison to MRP requirements, but does not plan to rank the designs; instead, the contractor designs and evaluations and the Air Force assessments will be provided to the review group for further evaluation. The GAO also learned that, two contractors will compare three to five of the manufacturer designs with current aircraft to determine which designs best meet mission requirements for survivability, effectiveness, and cost. (pp. 3-4, pp. 22-24/GAO Draft Report)

Now on pp. 2-4, 20-22.

DOD RESPONSE: Concur.

- **FINDING I: Mission Requirements**. The GAO found that, before the CASADA study, CAS requirements were not clearly defined. The GAO reported that the Air Force Aeronautical Systems Division, which analyzed the proposals from the 1985 solicitation, concluded all were technically viable candidates and it was difficult to eliminate a candidate because CAS requirements were not specific. The GAO further reported that, since that time, however, both the Army and the Air Force have more fully explained the tactical air support requirements. The GAO noted that the Air Force also provided the manufacturers with more specific aircraft design options to be considered in phase 2--specifically (1) aircraft hardware requirements, (2) aircraft performance parameters, and (3) reliability, maintainability, and supportability requirements. The GAO also found that some of the design requirements for new aircraft are more stringent than those for modified aircraft (for example, under the reliability and maintainability requirements, combat turnaround time for new aircraft is 15 minutes versus 25 minutes for modified aircraft). (pp. 24-25/GAO Draft Report)

Now on pp. 22-24

DOD RESPONSE: Concur. Inclusion of BAI as a prime (rather than secondary) mission for the CASADA designs means the new CAS aircraft may be designed to the BAI requirement rather than to a CAS requirement. The F-16 can do the BAI mission; the question is can it survive in a CAS mission and is it a suitable aircraft to replace the A-10 or is a new aircraft designed for CAS a better choice?

- **FINDING J: Cost and Budgetary Implications**. The GAO noted that, according to the Air Force, the estimated cost of developing a CAS and BAI aircraft to replace the A-10 would require $2 to $3 billion. The GAO further noted that, although the DoD review group, in its comments on the MRP, recommended the unit cost for a new aircraft be between $7 to $13 million, the CASADA MRP set only a lower unit cost limit of $7 million, but not an upper limit. The GAO found that the contractors involved in the CASADA study are projecting a unit cost ranging from $8 to $30 million. The GAO also reported that the 1985 Air Force request for information, which considered modifying in-production aircraft, estimated a unit cost between $7 to $12 million, with the A-16 estimated to cost about $110 million for development and $13 million per aircraft (FY 1986 dollars). The GAO concluded that the total program cost of the A-10 replacement is unknown and cannot begin to be estimated until key decisions on aircraft and schedule are made. Although Air Force officials indicated they are uncertain when funding for a replacement aircraft will be requested (because the CASADA study is underway and decisions on the A-10 replacement have not been made), the GAO reported that in a March 21, 1988, hearing before the Senate Committee on Armed Services, the Chairman of the DoD review group stated that such funds will be requested in the FY 1990 budget and, further, that the request will be made, even if the final decision on the replacement aircraft has not been made. (p. 5, p. 26/GAO Draft Report)

Now on pp. 4, 25

DOD RESPONSE: Partially concur. There is no uniquely defined A-10 replacement program in the Air Force budget other than that which would be part of the F-16 procurement. This was an issue addressed by the Defense Resource Board (DRB) in the Fall of 1987 and the DRB will consider it again in the Fall of 1988, prior to finalizing the FY1990-FY1991 Budget Submission. During the hearing, the DoD did not state that funds would be requested in the FY 1990 budget. Rather, the DoD stated that we are hoping to be in a position by the fall to decide whether or not to leave a hole or a place in the five year plan for a new close air support aircraft.

- **FINDING K: Schedule For Replacing A-10**. The GAO reported that the Air Force wants to begin replacing the A-10s in the CAS role as early as 1993, some 2 to 5 years earlier than their 20-year service life, and which would be much earlier than required by their structural life. The GAO found that the current CASADA study establishes two time frames for replacing the A-10s; a 1992 to 1995 time frame for an upgraded, existing/in-production replacement aircraft and a 1995 to 2000 time frame for a new aircraft. The GAO observed that the Air Force has not clearly articulated reasons for wanting to replace the A-10 early and why the 1993 time frame is critical. The GAO noted, however, that at the same March 21, 1988, hearing before the Senate Committee on Armed Services, the Chairman of the OSD review group also stated he was not sure the mid-1990s date for replacing the A-10 is all that critical. The GAO observed that Air Force studies show (1) the enemy threat in the CAS and BAI arena is anticipated to increase significantly in the post 1994 time frame and (2) the A-10 and other aircraft survivability will suffer due to this increasing threat. The GAO concluded, however, that since the Army will not be capable of conducting operations against follow-on forces with troops until the late 1990s (except on a limited scale), the A-10 early replacement does not appear to be predicated on the Army CAS needs beyond the front lines. (p. 2, p. 45, pp. 26-27/GAO Draft Report)

Now on pp. 2-3, 26

DOD RESPONSE: Concur. Maintaining the A-10 in the force structure or upgrading it remain as options. There is funding in the Air Force budget for modification of communications, navigation, terrain avoidance and targeting capability. Reengining and/or the addition of a Forward Looking Infrared (FLIR) is still an option.

- **FINDING L: Force Structure Implications.** The GAO observed that decisions on the A-10 replacement will change the Air Force tactical force structure since a replacement aircraft (which could take about 9 to 11 years to develop) could require maintaining existing A-10s in the force until the late 1990s. The GAO noted that this, in turn, could delay the planned conversion of the 120 A-10s to a forward air control role by the late 1990s. The GAO reported that, according to Tactical Air Command officials, in April 1989, the Air Force plans to replace one Air National Guard unit A-10s with F-16s and designate that unit's aircraft to perform the CAS and BAI missions. The GAO further reported that the Air Force could also replace the remaining A-10s with F-16s, but if so, about 50 percent of the tactical forces would then be F-16 type aircraft. The GAO concluded that, if the DoD approves the A-16 as the A-10 replacement, the Air Force could see an earlier change in the tactical force structure than would be realized from developing a replacement aircraft. (p. 3, pp. 5-6, p. 27/GAO Draft Report)

Now on pp. 3-4, 26-27

DOD REPONSE: Concur.

RECOMMENDATIONS

- NONE

*U.S. G.P.O. 1989-[illegible]